

Corporate Environmental Remediation



Sunoco, Inc.
10 Industrial Highway MS4
Lester, PA 19029

April 26, 2013

Mr. Steve O'Neil
Chief, Operations Section
Pennsylvania Department of Environmental Protection
2 East Main Street
Norristown, PA 19401

Re: Philadelphia Refinery Remediation Program
Remediation Status Report, First Quarter 2013

Dear Mr. O'Neil:

Enclosed for your review is a quarterly summary report for Operation & Maintenance (O&M) work completed at the Philadelphia Energy Solutions Refining & Marketing LLC (PES) Philadelphia Refinery between January 1 and March 31, 2013. Detailed information regarding O&M activity is included in the attached tables and figures for the Philadelphia Refinery as prepared by Stantec Consulting Services Inc. (Stantec). This letter summarizes the information detailed in the tables plus additional activities under the Consent Order & Agreement (CO&A) such as investigations of the various Areas of Interest (AOIs).

Pursuant to the 2003 CO&A between Sunoco and the PADEP, Sunoco has completed site characterization activities for all 11 AOIs. This facility has since been entered into the Pennsylvania One Cleanup Program. On November 30, 2011, Sunoco submitted a "Work Plan for Site Wide Approach under the One Cleanup Program" (Site Wide Approach) to PADEP and USEPA. The Site Wide Approach expands the technical approach outlined in the CO&A and provides a schedule for future Act 2 submissions with respect to the Philadelphia Refinery remediation program. Site Characterization Reports submitted to the agencies will be repackaged into Site Characterization/Remedial Investigation Reports (SCR/RIR). Status and anticipated dates of submittals will be updated in the quarterly Remediation Status Reports.

As the Department is aware, on September 8, 2012, Sunoco conveyed the refinery to PES. As part of that transaction, Sunoco retained responsibility for remediation activities for environmental conditions existing at the time of the transfer. Accordingly, Sunoco will continue to submit the required documentation and implement the required remedial obligations.

AOI 1 – Belmont Terminal / No. 1 Tank Farm / No. 2 Tank Farm

Consent Order / Characterization Status

Sunoco submitted to PADEP and USEPA a Site Characterization Report for AOI 1 dated June 30, 2005. Based on comments received by PADEP with regard to the AOI 1 Site Characterization Report, Sunoco prepared and submitted to PADEP a revised Site Characterization Report for AOI 1 dated July 17, 2006. The recommendations in the AOI 1 report were to supplement the existing remediation system along the northwestern portion of the Belmont Terminal and southeastern portion of the #1 Tank Farm. Sunoco has

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implemented these actions as detailed in previous quarterly reports. In addition, Sunoco provided PADEP a Remedial Action Plan (RAP) for AOI 1 in January 2008. As a result of the 26th Street North remediation system study and the S-50 Area investigation, an addendum to the RAP was considered necessary. In December 2008, a RAP addendum for AOI 1 was submitted to address the 26th Street North recovery system data analysis and the S-50 Area (26th Street South) investigation and subsequent remedial actions. A repackaged Site Characterization Report/Remedial Investigation Report (SCR/RIR) is currently being prepared for AOI 1. It is anticipated that the repackaged SCR/RIR will be submitted to the agencies in June 2014 with the subsequent submittal of the Cleanup Plan in June 2015.

Belmont Terminal – Operation During the Quarter

The Loading Rack system has active water pumps in RW-22 through RW-24. The Loading Rack System was operational throughout the quarter with the exception of routine/minor maintenance. Product pumps in RW-22, RW-23, and RW-24 were turned off but are checked weekly and manually operated as recoverable product thicknesses accumulate in each well.

On August 30, 2012, the Frontage Road System was turned off and will remain offline unless there are significant increases in LNAPL in the recovery wells. The wells were gauged weekly and no product was detected during the reporting period.

A total of 1,439,615 gallons of groundwater and 279 gallons of LNAPL were recovered by the Belmont Terminal recovery systems. System recovery totals for the quarter can be found in Attachment 1.

Belmont Terminal – System Performance

The Frontage Road system, when active, discharges directly into a benzene NESHAP controlled sewer routed to the Point Breeze Area Wastewater Treatment Plant rather than discharging to the City of Philadelphia sewer system. Recovered groundwater from the Loading Rack system is discharged to the same refinery sewer and recovered LNAPL is discharged to an onsite 5,000-gallon recovery tank, the contents of which are recycled by the refinery on an as needed basis.

Shunk Street Sewer Ventilation System and Biofilter – Operation During the Quarter

The biofilter was operational for the reporting period. System data for the quarter can be found in Attachment 1.

26th Street Sewer Area – Operation During the Quarter

Due to high iron content of the total fluids recovered, the pumps routinely become fouled. During weekly visits, pumps are pulled, cleaned, and redeployed as needed. Similarly, the system flow meter also fouls with iron, therefore, actual gallons recovered may be greater than recorded for some weekly visits. The system was operational for the reporting period although the flow meter was bypassed until it was replaced on January 18. The flow meter was frozen on January 25 and was removed, cleaned, and reinstalled on February 1. The system was off February 26 through March 7 to segregate the 400-series wells. The compressor was not operational on March 21 and March 26 then was left off for the annual gauging event.

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A total of 326,508 gallons of total fluids was recovered by the 26th Street recovery system. System recovery totals for the quarter can be found in Attachment 1.

26th Street Sewer Area – System Performance

26th Street North:

Sunoco has conducted a performance assessment of this system to better determine the effectiveness of remediation in this area. In general, Sunoco believes that the reporting of groundwater and LNAPL recovery provides limited indication of system performance, and should be supplemented with measurements related to maintaining groundwater level and affecting a gradient towards collection points.

It was concluded in the AOI 1 RAP Addendum that the extent of LNAPL has not changed significantly; however LNAPL thickness appears to have decreased over time, indicating stability of LNAPL along the 26th Street North Area.

26th Street South (S-50 Area):

A comprehensive groundwater investigation was conducted in the 26th Street South area. This data and proposed remedial action was included in the AOI 1 RAP Addendum. To minimize the migration of soluble phase contaminants, a biologically active aerobic barrier utilizing oxygen injection was recommended for the area. A thirty point O₂ injection system was installed to accomplish this barrier. Operational and performance data is collected in accordance with the performance monitoring plan and is included in Attachment 2.

26th Street Biofilter – Operation During the Quarter

The biofilter was operational throughout the quarter with the following exceptions. On January 4, 2013, the system was not operational due to broken belts on the blower. The belts were replaced and the system was returned to service the same day. On February 28, the system building was found without power. The facility electricians determined that the breakers in a nearby substation were blown and the system was returned to service on March 11.

The system operation is checked once per week and includes the collection of influent and effluent vapor concentrations utilizing a photoionization detector (PID). System data for the quarter can be found in Attachment 1.

AOI 2 – Point Breeze Processing Area

Consent Order / Characterization Status

The AOI 2 SCR/RIR was submitted to PADEP and USEPA on September 29, 2010. It is anticipated that a repackaged SCR/RIR will be submitted to the agencies in November 2013 with a subsequent submittal of the Cleanup Plan in May 2015.

Pollock Street Sewer Area – Operation During Quarter

During October 2011, heavier than usual quantities of oil were observed within the Pollock Street sewer outfall. As a result, Sunoco completed the expansion of the existing vertical recovery well remediation system in the vicinity of the Pollock Street sewer outfall in February 2012. The system, referred to as the

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Pollock Street West End System, consists of a total of ten 4-inch diameter recovery wells on the east side of River Road and twenty 6-inch diameter recovery wells on the west side of River Road. Water and LNAPL are removed from select recovery wells using pneumatic submersible pumps. All liquids are processed through an oil water separator. Water is discharged to a refinery process sewer and oil is recovered in a series of two 550-gallon tanks and then recycled by the refinery. A report describing the details of the investigation and remediation performed in response to the oil observed in the Pollock Street outfall was submitted to PADEP and USEPA on June 29, 2012.

The Pollock Street West End System was operational throughout the quarter with the exception of minor maintenance. The system was shut-off from January 30 through February 4 due to an issue with the clarifier at the Point Breeze Bioplant. A total of 2,143,716 gallons of groundwater and 1,528 gallons of LNAPL were recovered by this system in the quarter.

The Pollock Street Vertical Well System consists of RW-101, RW-102, and RW-103. All other vertical wells are either turned off or incorporated into the West End System. The vertical wells were operational throughout the quarter with the exception of routine maintenance. A total of 689,160 gallons of total fluids were recovered by the Pollock Street vertical well recovery system. System recovery totals for the quarter can be found in Attachment 1.

Horizontal wells HW-1, HW-2 and HW-3 were operational for the reporting period with the exception of routine maintenance. The flow rates for the horizontal well recovery system are estimated to be as follows:

- HW-1: 8 gpm
- HW-2: 3.7 gpm
- HW-3: 15.4 gpm

A total of 3,391,085 gallons of total fluids was recovered by the Pollock Street Horizontal Well Recovery System. System recovery totals for the quarter can be found in Attachment 1.

The Pollock Street Sewer outfall is checked three times per shift and all findings are recorded. This practice will continue and any LNAPL will be handled with spill control equipment to minimize or prevent releases to the Schuylkill River. Sunoco has continued to maintain boom and sorbent sweeps around the tide gate area. Outfall cleaning, including the changing of sorbents and removal of any fugitive LNAPL from the outfall, occurs a minimum of twice per week. The skimmer discharge was tied into the West End System treatment trailer during construction of the Pollock Street West End System.

The outfall skimmer was operational throughout this reporting period with the following exceptions. On January 3, the system was inoperable due to clogged transfer pump intake. The pump was removed and cleaned, the intake line was unclogged, a vacuum truck was used to clean the sump area, and the system was restarted. On January 22, the transfer pump was running but not moving any water. The skimmer sump and intake which was clogged with debris was cleaned out with a vacuum truck. The pump was reinstalled but the underground discharge line was frozen. On January 28, the discharge line was insulated and the system was restarted. On January 29, the skimmer was inoperable, the transfer pump was replaced with a new pump, and the system restarted. On January 30, the system was turned off for the evening due to a forecasted storm. On February 1, the skimmer belt was wrapped around the rollers and the lower gear on the chain drive was damaged. The drive gear was replaced and the belt was cleared from the rollers before the system was restarted. On February 4, the skimmer belt was wrapped around the rollers, the drive gears were disconnected, the belt was freed, ice was thawed, a new roller was

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fabricated and installed, and the system was restarted. On February 19, the heater was serviced and the system was returned to service. On March 6, the transfer pump motor was replaced.

Short Pier – Operation During the Quarter

There was no evidence of LNAPL migration to the river during the reporting period. Unless evidence of LNAPL migration to the river occurs, the system will remain offline.

AOI 3 – Impoundment Area

There are no groundwater or LNAPL recovery systems active in this area. The AOI 3 SCR/RIR was submitted to PADEP and USEPA on September 27, 2010. The SCR/RIR stated that given the limited occurrence and mobility of LNAPL observed in RW-2, the recovery system will remain offline. The disposition of remediation systems in AOI 3 will be revisited in the Cleanup Plan. It is anticipated that a repackaged SCR/RIR will be submitted to the agencies in January 2014 with the subsequent submittal of the Cleanup Plan in July 2014.

AOI 4 – No. 4 Tank Farm Area

Consent Order / Characterization Status

AOI 1 and AOI 4 were identified by Sunoco as the first areas of the Refinery to be investigated in accordance with the Phase II Corrective Action Schedule included in the CCR. Following characterization of AOI 4, Sunoco recommended the installation of a hydraulic control system on the southern border of AOI 4. This system is designed and permitted for discharge by the Philadelphia Water Department (PWD). A permit to operate from Air Management Services has been received by Sunoco. The installation of this remediation system was completed in December 2012. Minor modifications to the system have been implemented to facilitate water discharge monitoring in accordance with the PWD permit. The system was started on March 20, 2013. A total of 312,800 gallons of groundwater was recovered by this system between March 20 and April 1, 2013.

It is anticipated that the repackaged SCR/RIR will be submitted to the Agencies in October 2013 with a subsequent submittal of the Cleanup Plan in April 2014.

S-30 and S-36 LNAPL Recovery Systems – Operation During the Quarter

Due to the absence of recoverable product in the recovery wells, Sunoco recommends that S-30, S-34, S-35, and S-36 remain offline.

AOI 5 – Girard Point South Tank Field

Consent Order / Characterization Status

In accordance with the Site Wide Approach, a repackaged Site Characterization Report/Remedial Investigation Report/Cleanup Plan (SCR/RIR/Cleanup Plan) was submitted to PADEP and USEPA on December 13, 2011. Sunoco received PADEP's comment letter for AOI 5 on March 15, 2012. A RIR Addendum will be submitted to the agencies in December 2013 with a subsequent submittal of the Cleanup Plan in June 2014.

9 Berth – Operation During the Quarter

The system remains offline due to limited presence of LNAPL.

AOI 6 – Girard Point Chemicals Processing Area

Consent Order / Characterization Status

AOI 6 was identified by Sunoco as the third area of the Refinery to be investigated in accordance with the Phase II Corrective Action Schedule included in the CCR. A Site Characterization Report for AOI 6 was submitted to PADEP and USEPA on September 29, 2006. It is anticipated that the repackaged SCR/RIR will be submitted to the agencies on September 16, 2013 with a subsequent submittal of the Cleanup Plan in March 2014.

27 Pump House – Operation During the Quarter

The system was turned off September 20, 2010 due to absence of recoverable product. Recovery wells B-124, B-132, B-137, B-139, B-142, B-143, and B-147 contain absorbent socks. During the reporting period, wells were routinely gauged and the absorbent socks were replaced when necessary. LNAPL recovery volumes are recorded using a graduated beaker and recovered product is transferred to the system holding tank. Passive remediation will continue until no measurable product is observed or until recoverable thicknesses of LNAPL return to the recovery wells.

Approximately 14 gallons of LNAPL were recovered using the above referenced methods. Recovery totals for the quarter can be found in Attachment 1.

AOI 7 – Girard Point Fuels Processing Area

Consent Order / Characterization Status

In accordance with the Site Wide Approach, a repackaged AOI 7 SCR/RIR was submitted to PADEP and USEPA on February 29, 2012. A RIR Addendum will be submitted to the agencies in September 2013 with a subsequent submittal of the Cleanup Plan in March 2014.

No. 3 Separator / Bulkhead Area

On July 12, 2011, Sunoco reported a hydrocarbon sheen on the Schuylkill River to the National Response Center. The sheen was directly adjacent to the Girard Point No. 3 Separator. In response to the sheen on the river, Sunoco investigated the source of hydrocarbons to the river through the installation of monitoring wells and exploratory excavation around a process sewer junction box associated with the 137 Crude Unit and the No. 3 Separator. The monitoring wells demonstrated measurable oil on the water table and the exploratory excavation revealed integrity issues with the junction box. The junction box and associated bulkhead penetration were sealed with concrete.

Construction of a ten recovery well hydraulic control system was completed on August 23, 2012. LNAPL and water are extracted using pneumatic submersible pumps and total fluids pass through an oil

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water separator. Water is discharged to an onsite process sewer and LNAPL is recovered in a tank and recycled by the refinery.

On March 19, 2013, the remediation system shut down due to high level in the recovery tank. The tank was evacuated and the system was restarted. Due to an increase in product recovery, the tank was placed on a more frequent evacuation schedule. The system recovery wells and performance monitoring wells were gauged. Well gauging demonstrated an increased thickness of oil in the recovery wells and performance monitoring wells. No oil was observed in the river. The release was verbally communicated by PES to Andrew Sinclair of the PADEP on March 28, 2013. PES initiated an investigation of the adjacent process sewer line which revealed breaches in the sewer line adjacent to a junction box. The PES investigation/repair is ongoing. Any questions regarding the investigation or repair of the sewer should be directed to Chuck Barksdale at charles.barksdale@pes-companies.com.

The system was operational throughout the quarter. A total of 1,157,100 gallons of groundwater and 12,378 gallons of LNAPL were recovered by this system during this quarter. Groundwater and product recovery totals including system startup through the end of the reporting period can be found in Attachment 1.

AOI 8 – Point Breeze North Yard

Consent Order / Characterization Status

A repackaged Remedial Investigation Report incorporating PADEP's comments on AOI 8 was submitted to PADEP and USEPA on January 31, 2012. A Cleanup Plan incorporating the redevelopment efforts in the Philadelphia Refinery Point Breeze North Yard will be developed by December 2018.

PGW Border Recovery System – Operation During the Quarter

The PGW Total Fluids Recovery System is offline. The system is being evaluated for potential upgrade.

Jackson Street Sewer Area – Operation During the Quarter

The Jackson Street Sewer Total Fluids Recovery System is offline. Due to limited LNAPL presence in the area, the system will remain off unless there are significant increases in LNAPL in the proximal wells. The Jackson Street combined sewer overflow outfall ("CSO") is checked once per shift by refinery personnel for a sheen or the presence of LNAPL. There has been no evidence of sheening throughout the quarter.

Jackson Street Sewer Water Curtain – Operation During the Quarter

The Jackson Street Water Curtain was operational during the quarter with one exception. On January 8 the system was not operating as PES turned off the fire water in the North Yard to repair a leak. The leak was repaired and the water curtain was returned to service on January 18. Due to reliability issues, the flow meter for the water curtain was taken out of service. Water flow rate is irrelevant to system operation. System data for the quarter is included in Attachment 1.

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Sunoco agreed at the July 30, 2009 meeting to sample the air in the sewer onsite and offsite following notification from PADEP of a neighborhood (28th and McKean Streets) complaint. No complaints were received during this quarter. Sunoco recommends that operation of the water curtain be discontinued.

North Yard Bulkhead Area and No. 3 Tank Farm Separator – Operation During the Quarter

The system was taken offline. Due to limited LNAPL presence in the area, the system will remain off unless there are significant increases in LNAPL in the proximal wells.

AOI 9 – Schuylkill River Tank Farm

There are no groundwater or LNAPL recovery systems operational in the area. A Site Characterization Report was submitted to the PADEP and USEPA on October 30, 2009. It is anticipated that the repackaged SCR/RIR will be submitted to the agencies in April 2014 with a subsequent submittal of the Cleanup Plan in November 2014.

AOI 10 – West Yard

There are no groundwater or LNAPL recovery systems operational in the area. A SCR/RIR was submitted to PADEP and USEPA on June 30, 2011. Approval of the Remedial Investigation Report was received from PADEP on January 6, 2012. A Cleanup Plan for the Philadelphia Refinery Point Breeze West Yard will be developed by December 2018.

AOI 11 – Deep Aquifer

The SCR/RIR was submitted to PADEP and USEPA on September 12, 2011. Sunoco received comments to the report by email on December 9, 2011. It is anticipated that the Final Report will be submitted to the agencies in July 2013.

Passyunk Avenue Sewer

The Passyunk Avenue Sewer CSO is checked by PES personnel once per shift at low tide and findings are recorded. LNAPL was not observed at the Schuylkill River outfall during the quarter.

Groundwater Monitoring

The current monitoring program consists of quarterly groundwater and LNAPL gauging of select wells, annual groundwater and LNAPL gauging of site-wide wells, and annual groundwater sampling of select perimeter monitoring wells. The site-wide annual well gauging event is typically conducted during the second quarter of each year with results used to identify the presence of LNAPL and determine groundwater flow patterns. During the first, third, and fourth quarters, select wells are gauged to monitor LNAPL thickness and determine hydraulic effects of targeted recovery systems. Liquid level measurements collected during the first quarter of 2013 are provided in Table 1.

The purpose of the annual groundwater sampling event is to evaluate concentration trends at the perimeter of the refinery. The annual groundwater sampling program consists of sampling select wells throughout the Point Breeze and Girard Point Processing Areas and has historically been performed during the fourth quarter of each year. However, future annual perimeter groundwater sampling will be performed in the

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second quarter in conjunction with annual site-wide gauging.

In 2012, the annual gauging and sampling schedule was altered in order to perform synoptic events with PGW and DLA for purposes of generating a larger scale groundwater elevation map tying all of the facilities together. The gauging was performed in May 2012 and the data was included in the Third Quarter 2012 Remediation Status Report. Groundwater sampling of the groundwater wells in AOI 1 was performed synoptically with PGW and DLA in July 2012. The results of the full effort will be submitted under separate cover.

Please contact me at (610) 833-3444 with any questions or comments.

Best Regards,



James Oppenheim, PE
Senior Environmental Consultant

Enclosures (electronic):

- Figure 1 – Site Location Map
- Figure 2 – Remediation System Areas Site Plan
- Table 1 – First Quarter 2013 Gauging Event
- Attachment 1 – Remediation System Recovery Total Data
- Attachment 2 – 26th Street South (S-50 Area) Report

Cc:

United States Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103
Attention: Mr. Paul Gotthold (3WC22)

Mr. Nicholas Maliha, P.E.
Philadelphia Water Department
1101 Market Street, ARA Mark, 4th Floor
Philadelphia, PA 19107

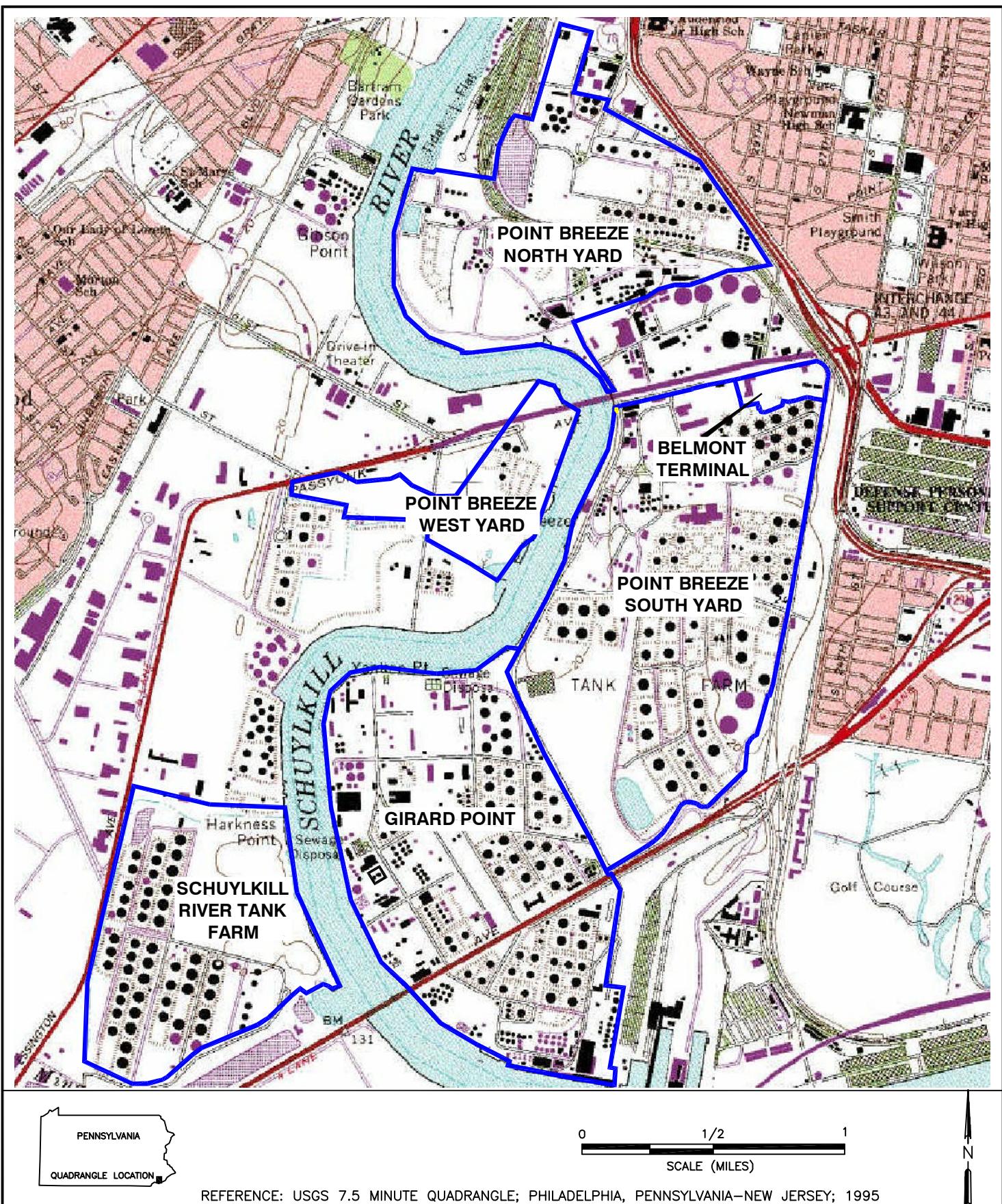
Jennifer Menges
Stantec Consulting Services Inc.
1060 Andrew Drive, Suite 140
West Chester, PA 19380

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Charles D. Barksdale, Jr. PE
PES Refining & Marketing, LLC
3144 Passyunk Avenue
Philadelphia, PA 19145

File: Remediation Status Report
Philadelphia Refinery, 1st Quarter 2013

FIGURES



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FOR:

SUNOCO, INC. (R&M)
PHILADELPHIA REFINERY
PHILADELPHIA, PENNSYLVANIA

SITE LOCATION MAP PHILADELPHIA REFINERY REMEDIATION PROGRAM

FIGURE:

1

JOB NUMBER:

BY:

CHECKED BY:

1

APPROVED BY:

1

DATE:



SOURCE: BASEMAP PROVIDED BY LANGAN ENGINEERING AND ENVIRONMENTAL SERVICES

SHALLOW / INTERMEDIATE / DEEP MONITORING WELL

SHALLOW / INTERMEDIATE MONITORING WELL

UNABLE TO LOCATE WELL

POLLOCK STREET SEWER

POLLOCK STREET HORIZONTAL WELL

SHALLOW / INTERMEDIATE O₂ MONITORING WELL

DEEP MONITORING WELL

INTERMEDIATE MONITORING WELL

SHALLOW MONITORING WELL

OTHER MONITORING WELL

PIEZOMETER

DEEP RECOVERY WELL

INTERMEDIATE RECOVERY WELL

SHALLOW RECOVERY WELL

OTHER RECOVERY WELL

SHALLOW/INTERMEDIATE RECOVERY WELL

DAMAGED WELL

STAFF GAUGE

AREA OF INTEREST

FIGURE 2

SITE PLAN

FOR: Sunoco, Inc. (R&M)
Philadelphia Refinery
3144 Passyunk Avenue
Philadelphia, PA. 19145

SCALE: 1"=800'
200' 300 FEET
DRAFT DRW 128

TABLE

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
First Quarter 2013 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 1	MW-26	2/26/2013	22.94	24.76	1.82	No	Static	
AOI 1	MW-27	2/26/2013	24.96	26.13	1.17	No	Static	
AOI 1	MW-28	2/26/2013	---	25.41	0	No	Static	
AOI 1	MW-29	2/26/2013	25.35	25.95	0.60	No	Static	
AOI 1	MW-30	2/26/2013	---	27.94	0	No	Static	
AOI 1	MW-31	2/26/2013	---	25.74	0	No	Static	
AOI 1	MW-32	2/26/2013	---	25.53	0	No	Static	
AOI 1	MW-33	2/26/2013	---	26.65	0	No	Static	
AOI 1	MW-35	2/26/2013	---	27.60	0	No	Static	
AOI 1	MW-36	2/26/2013	---	28.76	0	No	Static	
AOI 1	MW-37	2/26/2013	---	27.88	0	No	Static	
AOI 1	MW-38	2/26/2013	---	23.96	0	No	Static	
AOI 1	MW-39	2/26/2013	---	23.88	0	No	Static	
AOI 1	MW-40	2/26/2013	24.21	24.63	0.42	No	Static	
AOI 1	MW-41	2/26/2013	23.79	23.81	0.02	No	Static	
AOI 1	MW-43	2/25/2013	---	26.97	0	No	Static	
AOI 1	MW-44	2/26/2013	---	26.24	0	No	Static	
AOI 1	OW-2	2/26/2013	---	27.85	0	No	Static	
AOI 1	OW-12	2/26/2013	---	26.21	0	No	Static	
AOI 1	OW-13	2/26/2013	---	28.37	0	No	Static	
AOI 1	OW-14	2/26/2013	---	28.44	0	No	Static	
AOI 1	OW-16	2/26/2013	NA	NA	NA	No	Static	not accessible; vehicle parked on top of vault
AOI 1	OW-17	2/26/2013	---	26.75	0	No	Static	
AOI 1	OW-18	2/26/2013	---	27.86	0	No	Static	
AOI 1	OW-19	2/26/2013	27.08	27.16	0.08	No	Static	
AOI 1	OW-20	2/26/2013	---	28.11	0	No	Static	
AOI 1	PZ-400	2/26/2013	---	24.62	0	No	Static	
AOI 1	PZ-401	2/25/2013	20.69	20.74	0.05	No	Static	
AOI 1	PZ-402	2/25/2013	20.50	20.83	0.33	No	Static	
AOI 1	PZ-403	2/25/2013	25.30	25.32	0.02	No	Static	
AOI 1	PZ-404	2/25/2013	27.03	27.68	0.65	No	Static	
AOI 1	RW-1	2/26/2013	NA	NA	NA	Yes	Static	not accessible; vehicle parked on top of vault
AOI 1	RW-4	2/26/2013	26.40	27.89	1.49	Yes	Static	
AOI 1	RW-6	2/26/2013	---	27.29	0	Yes	Static	
AOI 1	RW-7	2/26/2013	---	24.51	0	Yes	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
First Quarter 2013 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 1	RW-15	2/26/2013	---	27.49	0	Yes	Static	
AOI 1	RW-21	2/26/2013	24.94	24.94	<0.01	Yes	Static	
AOI 1	RW-22	2/26/2013	---	23.60	0	Yes	Pumping	
AOI 1	RW-23	2/26/2013	25.92	27.58	1.66	Yes	Pumping	
AOI 1	RW-24	2/26/2013	23.45	24.81	1.36	Yes	Pumping	
AOI 1	RW-25	2/26/2013	26.15	27.84	1.69	Yes	Static	
AOI 1	RW-26	2/26/2013	---	26.12	0	Yes	Static	
AOI 1	RW-27	2/26/2013	---	26.72	0	Yes	Static	
AOI 1	RW-28	2/26/2013	---	26.22	0	Yes	Static	
AOI 1	RW-29	2/26/2013	---	26.41	0	Yes	Static	
AOI 1	RW-30	2/26/2013	---	26.30	0	Yes	Static	
AOI 1	RW-31	2/26/2013	---	26.82	0	Yes	Static	pump is stuck in well
AOI 1	RW-32	2/26/2013	---	24.75	0	Yes	Static	
AOI-1	RW-110	2/25/2013	---	17.39	0	Yes	Static	formerly S-160
AOI-1	RW-111	2/25/2013	---	17.59	0	Yes	Static	formerly S-172
AOI-1	RW-112	2/25/2013	---	17.50	0	Yes	Static	formerly S-173
AOI 1	RW-400	2/26/2013	---	30.40	0	Yes	Pumping	
AOI 1	RW-401	2/25/2013	21.62	21.94	0.32	Yes	Static	formerly S-94
AOI 1	RW-402	2/25/2013	---	19.02	0	Yes	Static	
AOI 1	RW-403	2/25/2013	---	22.25	0	Yes	Static	formerly S-90
AOI 1	RW-404	2/25/2013	---	23.51	0	Yes	Static	
AOI 1	RW-405	2/25/2013	25.31	25.31	<0.01	Yes	Static	
AOI 1	RW-406	2/25/2013	23.86	24.12	0.26	Yes	Static	
AOI 1	S-41	2/25/2013	---	26.40	0	No	Static	
AOI 1	S-42I	2/25/2013	---	26.04	0	No	Static	formerly S-42D
AOI 1	S-43	2/25/2013	---	24.73	0	No	Static	
AOI 1	S-44	2/25/2013	---	26.18	0	No	Static	
AOI 1	S-45	2/25/2013	---	2.10	0	No	Static	
AOI 1	S-46	2/25/2013	---	22.29	0	No	Static	
AOI 1	S-46D	2/25/2013	---	15.55	0	No	Static	
AOI 1	S-47I	2/25/2013	---	19.64	0	No	Static	
AOI 1	S-50	2/25/2013	---	23.31	0	No	Static	
AOI 1	S-51	2/25/2013	---	23.01	0	No	Static	
AOI 1	S-52	2/25/2013	---	23.76	0	No	Static	
AOI 1	S-74	2/26/2013	---	26.31	0	No	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
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AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 1	S-75	2/26/2013	---	27.65	0	No	Static	
AOI 1	S-76	2/26/2013	27.53	27.97	0.44	No	Static	
AOI 1	S-77	2/25/2013	12.83	13.30	0.47	No	Static	
AOI 1	S-77P	2/25/2013	---	29.49	0	No	Static	
AOI 1	S-78	2/25/2013	---	27.22	0	No	Static	
AOI 1	S-79	2/25/2013	24.05	24.46	0.41	No	Static	
AOI 1	S-79P	2/25/2013	---	27.25	0	No	Static	
AOI 1	S-80	2/25/2013	---	28.79	0	No	Static	
AOI 1	S-80D	2/25/2013	---	30.97	0	No	Static	
AOI 1	S-81	2/25/2013	22.06	22.07	0.01	No	Static	
AOI 1	S-82	2/25/2013	23.41	23.90	0.49	No	Static	
AOI 1	S-83	2/25/2013	20.55	21.23	0.68	No	Static	
AOI 1	S-84P	2/25/2013	---	20.13	0	No	Static	
AOI 1	S-85	2/25/2013	---	24.87	0	No	Static	
AOI 1	S-86	2/25/2013	27.40	27.40	<0.01	No	Static	
AOI 1	S-87I	2/25/2013	---	25.77	0	No	Static	
AOI 1	S-88	2/25/2013	---	25.65	0	No	Static	
AOI 1	S-88A	2/25/2013	---	26.43	0	No	Static	
AOI 1	S-89	2/25/2013	---	27.16	0	No	Static	
AOI 1	S-95	2/25/2013	---	23.02	0	No	Static	
AOI 1	S-98	2/25/2013	---	23.70	0	No	Static	
AOI 1	S-99	2/25/2013	---	25.88	0	No	Static	
AOI 1	S-100	2/25/2013	23.86	24.63	0.77	No	Static	
AOI 1	S-101	2/25/2013	---	47.90	0	No	Static	
AOI 1	S-116	2/25/2013	---	14.45	0	No	Static	
AOI 1	S-117	2/25/2013	---	17.98	0	No	Static	
AOI 1	S-118	2/25/2013	---	18.21	0	No	Static	
AOI 1	S-125	2/25/2013	23.12	23.30	0.18	No	Static	
AOI 1	S-126	2/25/2013	14.59	15.11	0.52	No	Static	
AOI 1	S-127	2/25/2013	---	17.13	0	No	Static	
AOI 1	S-162	2/25/2013	---	17.40	0	No	Static	
AOI 1	S-164	2/25/2013	---	16.31	0	No	Static	
AOI 1	S-179	2/25/2013	---	22.08	0	No	Static	
AOI 1	S-180	2/25/2013	---	21.90	0	Yes	Pumping	
AOI 1	S-181	2/25/2013	---	25.20	0	Yes	Pumping	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
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AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 1	S-182	2/25/2013	22.89	22.94	0.05	Yes	Static	
AOI 1	S-183	2/25/2013	23.55	23.56	0.01	Yes	Static	
AOI 1	S-184	2/25/2013	23.00	23.00	<0.01	Yes	Pumping	
AOI 1	S-185	2/25/2013	---	23.96	0	Yes	Static	
AOI 1	S-186	2/25/2013	---	23.55	0	Yes	Static	
AOI 1	S-187	2/25/2013	---	24.43	0	Yes	Static	
AOI 1	S-188	2/25/2013	---	24.80	0	Yes	Static	
AOI 1	S-189	2/25/2013	---	26.05	0	Yes	Static	
AOI 1	S-190	2/25/2013	---	25.97	0	Yes	Static	
AOI 1	S-191	2/25/2013	---	27.22	0	Yes	Pumping	
AOI 1	S-192	2/25/2013	---	25.83	0	Yes	Static	
AOI 1	S-193	2/25/2013	---	24.53	0	No	Static	
AOI 1	S-194	2/25/2013	---	27.22	0	Yes	Static	
AOI 1	S-196	2/25/2013	---	46.14	0	No	Static	
AOI 1	S-198	2/25/2013	25.75	27.03	1.28	No	Static	
AOI 1	S-199	2/25/2013	25.60	26.97	1.37	No	Static	
AOI 1	S-200	2/25/2013	25.64	25.65	0.01	No	Static	
AOI 1	S-201	2/25/2013	24.31	25.44	1.13	No	Static	
AOI 1	S-202	2/25/2013	---	29.08	0	No	Static	
AOI 1	S-203	2/25/2013	28.86	29.13	0.27	No	Static	
AOI 1	S-205	2/25/2013	20.68	22.14	1.46	No	Static	
AOI 1	S-206	2/25/2013	---	28.29	0	No	Static	
AOI 1	S-207	2/25/2013	---	14.74	0	No	Static	
AOI 1	S-208	2/25/2013	---	20.13	0	No	Static	
AOI 1	S-209	2/25/2013	---	26.87	0	No	Static	
AOI 1	S-210	2/25/2013	24.55	24.55	<0.01	No	Static	
AOI 1	S-211	2/25/2013	---	14.79	0	No	Static	
AOI 1	S-212	2/25/2013	---	17.28	0	No	Static	
AOI 1	S-213	2/25/2013	---	14.85	0	No	Static	
AOI 1	S-214	2/25/2013	---	18.74	0	No	Static	
AOI 1	S-226	2/25/2013	---	22.59	0	No	Static	
AOI 1	S-227	2/25/2013	---	23.13	0	No	Static	
AOI 1	S-228	2/25/2013	---	22.47	0	No	Static	
AOI 1	S-230	2/25/2013	---	20.95	0	No	Static	
AOI 1	S-231	2/25/2013	---	20.92	0	No	Static	

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First Quarter 2013 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 1	S-232	2/25/2013	---	20.69	0	No	Static	
AOI 1	S-255	2/25/2013	---	23.44	0	No	Static	
AOI 1	S-256	2/25/2013	---	22.44	0	No	Static	
AOI 1	S-257	2/25/2013	---	24.21	0	No	Static	
AOI 1	S-258	2/25/2013	---	24.70	0	No	Static	
AOI 1	S-259	2/25/2013	---	25.39	0	No	Static	
AOI 1	S-260	2/25/2013	---	24.43	0	No	Static	
AOI 1	S-261	2/25/2013	---	22.55	0	No	Static	
AOI 1	S-262	2/25/2013	---	19.35	0	No	Static	
AOI 1	S-263	2/25/2013	---	16.90	0	No	Static	
AOI 1	S-264D	2/25/2013	---	26.89	0	No	Static	
AOI 1	S-265	2/25/2013	14.15	14.21	0.06	Yes	Static	
AOI 1	S-266	2/25/2013	NM	NM	NM	Yes	Static	lost in concrete piles from 26th St construction; CSX well
AOI 1	S-267	2/25/2013	---	17.25	0	Yes	Static	
AOI 1	S-268	2/25/2013	---	27.50	0	No	Static	formerly S-264; CSX well
AOI 1	S-269	2/25/2013	---	20.72	0	No	Static	
AOI 1	S-270	2/25/2013	---	22.34	0	No	Static	
AOI 1	S-271	2/25/2013	---	24.96	0	No	Static	
AOI 1	S-272	2/25/2013	---	24.51	0	No	Static	
AOI 1	S-273	2/25/2013	---	23.92	0	No	Static	
AOI 1	S-274	2/25/2013	---	23.80	0	No	Static	
AOI 1	S-275	2/25/2013	---	23.01	0	No	Static	
AOI 1	S-276	2/25/2013	23.10	23.74	0.64	No	Static	
AOI 1	S-277	2/25/2013	23.14	23.44	0.30	No	Static	
AOI 1	S-312	2/25/2013	---	6.61	0	No	Static	
AOI 1	S-330	2/26/2013	---	26.22	0	No	Static	
AOI 1	S-331	2/26/2013	---	28.30	0	No	Static	
AOI 1	S-332	2/25/2013	---	26.81	0	No	Static	
AOI 1	TW-3	2/26/2013	---	28.33	0	No	Static	
AOI 1	TW-5	2/26/2013	---	28.11	0	No	Static	
AOI 1	TW-8	2/26/2013	---	26.60	0	No	Static	
AOI 1	TW-9	2/26/2013	---	28.20	0	No	Static	
AOI 1	TW-10	2/26/2013	26.79	27.07	0.28	No	Static	
AOI 1	TW-11	2/26/2013	---	28.68	0	No	Static	
AOI 1	ARCO-1	2/25/2013	---	27.52	0	No	Static	

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AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 1	ARCO-1D	2/25/2013	---	27.55	0	No	Static	
AOI 1	ARCO-2	2/25/2013	---	26.58	0	No	Static	
AOI 1	ARCO-3	2/25/2013	---	25.30	0	No	Static	
AOI 2	RW-100	2/11/2013	21.47	21.59	0.12	Yes	Static	
AOI 2	RW-101	2/11/2013	---	19.95	0	Yes	Pumping	
AOI 2	RW-102	2/11/2013	17.32	17.33	0.01	Yes	Pumping	
AOI 2	RW-103	2/11/2013	21.40	21.41	0.01	Yes	Pumping	
AOI 2	RW-104	2/11/2013	---	14.25	0	Yes	Pumping	top of pump
AOI 2	RW-105	2/11/2013	---	14.30	0	Yes	Pumping	top of pump
AOI 2	RW-106	2/11/2013	---	14.60	0	Yes	Pumping	top of pump
AOI 2	RW-107	2/11/2013	---	12.41	0	Yes	Static	no pump
AOI 2	RW-108	2/11/2013	---	7.75	0	Yes	Static	no pump
AOI 2	RW-109	2/11/2013	---	9.21	0	Yes	Static	no pump
AOI 2	RW-113	2/11/2013	---	20.10	0	Yes	Pumping	top of pump
AOI 2	RW-114	2/11/2013	---	25.40	0	Yes	Pumping	top of pump
AOI 2	RW-115	2/11/2013	---	22.70	0	Yes	Pumping	top of pump
AOI 2	RW-116	2/11/2013	---	24.10	0	Yes	Pumping	top of pump
AOI 2	RW-117	2/11/2013	---	21.85	0	Yes	Pumping	top of pump
AOI 2	RW-118	2/11/2013	15.52	15.53	0.01	Yes	Pumping	pump removed for service
AOI 2	RW-119	2/11/2013	17.03	19.55	2.52	Yes	Pumping	raised up pump
AOI 2	RW-120	2/11/2013	17.47	17.86	0.39	Yes	Static	no pump
AOI 2	RW-121	2/11/2013	---	22.20	0	Yes	Pumping	top of pump
AOI 2	RW-122	2/11/2013	13.44	13.44	<0.01	Yes	Pumping	no pump
AOI 2	RW-123	2/11/2013	13.51	13.52	0.01	Yes	Static	no pump
AOI 2	RW-124	2/11/2013	---	22.30	0	Yes	Static	top of pump
AOI 2	RW-125	2/11/2013	---	22.10	0	Yes	Pumping	top of pump
AOI 2	RW-126	2/11/2013	---	20.95	0	Yes	Static	top of pump
AOI 2	RW-127	2/11/2013	---	26.10	0	Yes	Pumping	top of pump
AOI 2	RW-128	2/11/2013	---	21.80	0	Yes	Pumping	top of pump
AOI 2	RW-129	2/11/2013	---	21.90	0	Yes	Pumping	top of pump
AOI 2	C-HEADER	2/11/2013	9.41	9.41	<0.01	No	Static	
AOI 2	PZ-100	2/11/2013	---	18.24	0	No	Static	
AOI 2	PZ-101	2/11/2013	---	16.54	0	No	Static	
AOI 2	RIVER #1	2/11/2013	---	13.05	0	No	Static	at 09:15
AOI 2	S-48	2/11/2013	---	2.45	0	No	Static	casing broken off at grade and well is flooded

TABLE 1
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AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 2	S-53	2/11/2013	18.65	18.96	0.31	No	Static	
AOI 2	S-62	2/11/2013	20.83	20.83	<0.01	No	Static	
AOI 2	S-63	2/11/2013	22.67	24.23	1.56	No	Static	
AOI 2	S-64	2/11/2013	11.05	11.10	0.05	No	Static	
AOI 2	S-65	2/11/2013	10.88	10.92	0.04	No	Static	
AOI 2	S-91	2/11/2013	20.15	20.15	<0.01	No	Static	
AOI 2	S-92	2/11/2013	11.04	11.17	0.13	No	Static	
AOI 2	S-93	2/11/2013	---	20.85	0	No	Static	top of pump
AOI 2	S-130	2/11/2013	---	19.32	0	No	Static	
AOI 2	S-131	2/11/2013	15.95	16.80	0.85	No	Static	
AOI 2	S-132	2/11/2013	---	18.95	0	No	Static	
AOI 2	S-133	2/11/2013	---	19.04	0	No	Static	
AOI 2	S-134	2/11/2013	---	20.13	0	No	Static	
AOI 2	S-135	2/11/2013	20.90	21.07	0.17	No	Static	
AOI 2	S-136	2/11/2013	---	18.71	0	No	Static	
AOI 2	S-137	2/11/2013	---	17.68	0	No	Static	
AOI 2	S-139	2/11/2013	---	20.86	0	No	Static	
AOI 2	S-140	2/11/2013	---	21.77	0	No	Static	
AOI 2	S-141	2/11/2013	21.96	22.45	0.49	No	Static	
AOI 2	S-142	2/11/2013	20.26	20.32	0.06	No	Static	
AOI 2	S-143	2/11/2013	---	21.73	0	No	Static	
AOI 2	S-156	2/11/2013	18.29	18.52	0.23	No	Static	
AOI 2	S-159	2/11/2013	17.67	17.67	<0.01	No	Static	
AOI 2	S-165	2/11/2013	---	17.18	0	No	Static	
AOI 2	S-166	2/11/2013	---	16.64	0	No	Static	
AOI 2	S-167	2/11/2013	NM	NM	NM	No	Static	well is lost
AOI 2	S-174	2/11/2013	9.74	10.91	1.17	No	Static	
AOI 2	S-175	2/11/2013	18.02	18.59	0.57	No	Static	
AOI 2	S-177	2/11/2013	---	18.47	0	No	Static	
AOI 2	S-178	2/11/2013	---	17.38	0	No	Static	
AOI 2	S-246A	2/11/2013	---	11.15	0	No	Static	
AOI 2	S-247	2/11/2013	---	11.68	0	No	Static	
AOI 2	S-248	2/11/2013	---	10.26	0	No	Static	
AOI 2	S-249	2/11/2013	---	13.83	0	No	Static	
AOI 2	S-251	2/11/2013	---	20.60	0	No	Static	

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AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 2	S-252	2/11/2013	---	20.73	0	No	Static	
AOI 2	S-253	2/11/2013	---	20.88	0	No	Static	
AOI 2	S-254	2/11/2013	---	19.51	0	No	Static	
AOI 2	S-302	2/11/2013	23.40	24.04	0.64	No	Static	
AOI 2	S-302D	2/11/2013	---	24.61	0	No	Static	
AOI 2	S-303	2/11/2013	---	22.04	0	No	Static	
AOI 2	S-304	2/11/2013	12.62	12.62	<0.01	No	Static	
AOI 2	S-305	2/11/2013	---	18.79	0	No	Static	
AOI 2	S-305D	2/11/2013	---	20.14	0	No	Static	
AOI 2	S-306	2/11/2013	---	25.17	0	No	Static	
AOI 2	S-313	2/11/2013	---	22.50	0	No	Static	top of pump
AOI 2	S-314	2/11/2013	---	21.05	0	No	Static	
AOI 2	S-315	2/11/2013	---	24.00	0	No	Static	top of pump
AOI 2	S-316	2/11/2013	---	25.80	0	No	Static	top of pump
AOI 2	S-317	2/11/2013	---	20.40	0	No	Static	
AOI 2	S-318	2/11/2013	23.88	23.91	0.03	No	Static	
AOI 2	S-333	2/11/2013	---	13.42	0	No	Static	
AOI 2	S-346	2/11/2013	---	18.45	0	No	Static	
AOI 2	S-347	2/11/2013	18.11	18.43	0.32	No	Static	
AOI 2	S-348	2/11/2013	12.54	12.87	0.33	No	Static	
AOI 2	S-349	2/11/2013	18.03	18.28	0.25	No	Static	
AOI 3	RW-2	2/14/2013	11.93	12.27	0.34	Yes	Static	
AOI 4	RW-700	2/13/2013	---	17.38	0	No	Static	
AOI 4	RW-701	2/13/2013	---	18.01	0	No	Static	
AOI 4	RW-702	2/13/2013	---	20.20	0	No	Static	
AOI 4	RW-703	2/13/2013	---	19.93	0	No	Static	
AOI 4	RW-704	2/13/2013	---	18.21	0	No	Static	
AOI 4	RW-705	2/13/2013	---	15.07	0	No	Static	
AOI 4	RW-706	2/13/2013	---	15.25	0	No	Static	
AOI 4	RW-707	2/13/2013	---	15.61	0	No	Static	not hooked up to the new system
AOI 4	RW-708	2/13/2013	---	14.80	0	No	Static	
AOI 4	RW-709	2/13/2013	---	14.48	0	No	Static	
AOI 4	RW-710	2/13/2013	---	15.46	0	No	Static	not hooked up to the new system
AOI 4	RW-711	2/13/2013	---	14.77	0	No	Static	
AOI 4	RW-712	2/13/2013	---	14.85	0	No	Static	

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AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 4	RW-713	2/13/2013	---	14.30	0	No	Static	
AOI 4	RW-714	2/13/2013	---	14.49	0	No	Static	
AOI 4	RW-715	2/13/2013	---	14.65	0	No	Static	
AOI 4	RW-716	2/13/2013	---	14.77	0	No	Static	
AOI 4	RW-717	2/13/2013	---	14.79	0	No	Static	
AOI 4	S-29	2/14/2013	21.17	23.59	2.42	No	Static	
AOI 4	S-30	2/14/2013	22.31	25.16	2.85	Yes	Static	system was taken offline
AOI 4	S-34	2/14/2013	---	0.00	0	Yes	Static	well is flooded to top of casing; system was taken offline
AOI 4	S-35	2/14/2013	---	20.80	0	Yes	Static	system was taken offline
AOI 4	S-36	2/14/2013	---	24.05	0	Yes	Static	system was taken offline
AOI 5	RWBH-1	2/6/2013	---	2.72	0	Yes	Static	
AOI 5	RWBH-2	2/6/2013	---	2.55	0	Yes	Static	
AOI 6	B-124	2/15/2013	5.32	5.69	0.37	Yes	Static	absorbent sock in well
AOI 6	B-132	2/15/2013	---	4.47	0	No	Static	
AOI 6	B-135	2/15/2013	---	4.78	0	No	Static	
AOI 6	B-136	2/15/2013	4.35	4.35	<0.01	No	Static	
AOI 6	B-137	2/15/2013	3.81	4.16	0.35	No	Static	absorbent sock in well
AOI 6	B-139	2/15/2013	5.34	5.51	0.17	No	Static	absorbent sock in well
AOI 6	B-142	2/15/2013	---	6.73	0	No	Static	absorbent sock in well
AOI 6	B-143	2/15/2013	---	4.95	0	No	Static	absorbent sock in well
AOI 6	B-147	2/15/2013	5.59	5.59	<0.01	No	Static	
AOI 7	RW-801	2/14/2013	---	18.95	0	Yes	Pumping	top of pump
AOI 7	RW-802	2/14/2013	---	20.65	0	Yes	Pumping	top of pump
AOI 7	RW-803	2/14/2013	---	20.55	0	Yes	Pumping	top of pump
AOI 7	RW-804	2/14/2013	---	20.25	0	Yes	Pumping	top of pump
AOI 7	RW-805	2/14/2013	---	17.55	0	Yes	Pumping	top of pump
AOI 7	RW-806	2/14/2013	---	19.65	0	Yes	Pumping	top of pump
AOI 7	RW-807	2/14/2013	---	18.45	0	Yes	Pumping	top of pump
AOI 7	RW-808	2/14/2013	---	18.65	0	Yes	Pumping	top of pump
AOI 7	RW-809	2/14/2013	---	18.90	0	Yes	Pumping	top of pump
AOI 7	RW-810	2/14/2013	---	19.40	0	Yes	Pumping	top of pump
AOI 8	RW-200	2/6/2013	---	6.31	0	Yes	Static	
AOI 8	RW-201	2/6/2013	23.82	24.19	0.37	Yes	Static	
AOI 8	RW-202	2/6/2013	---	21.43	0	Yes	Static	
AOI 8	RW-203	2/6/2013	23.57	23.70	0.13	Yes	Static	

TABLE 1
Sunoco Philadelphia Refinery Remediation Program
First Quarter 2013 Gauging Event

AOI	Well ID	Date	Depth to LNAPL	Depth to Water	Apparent LNAPL Thickness	Recovery Well Y or N	Static or Pumping Conditions	Comments
AOI 8	RW-204	2/6/2013	20.20	21.90	1.70	Yes	Static	
AOI 8	RW-205	2/6/2013	20.15	22.75	2.60	Yes	Static	
AOI 8	RW-206	2/6/2013	22.30	23.51	1.21	Yes	Static	
AOI 8	RW-300	2/6/2013	15.00	15.26	0.26	Yes	Static	
AOI 8	RW-301	2/6/2013	---	12.71	0	Yes	Static	
AOI 8	RW-302	2/6/2013	---	14.06	0	Yes	Static	
AOI 8	RW-303	2/6/2013	---	14.77	0	Yes	Static	
AOI 8	RW-304	2/6/2013	---	15.58	0	Yes	Static	
AOI 8	RW-305	2/6/2013	---	15.44	0	Yes	Static	
AOI 8	RW-306	2/6/2013	13.50	13.60	0.10	Yes	Static	
AOI 8	RW-307	2/6/2013	---	14.89	0	Yes	Static	
AOI 8	RW-308	2/6/2013	---	17.15	0	Yes	Static	
AOI 8	RW-309	2/6/2013	---	15.97	0	Yes	Static	
AOI 8	RW-500	2/6/2013	---	2.07	0	Yes	Static	
AOI 8	RW-501	2/6/2013	---	5.60	0	Yes	Static	
AOI 8	RW-502	2/6/2013	8.82	9.33	0.51	Yes	Static	

Notes:

All measurements are in feet.

Groundwater monitoring was performed under pumping conditions except where indicated in the comments column.

LNAPL = light non-aqueous phase liquid

--- = LNAPL not present

NM = field reading not measured

NA = Not Accessible, Not Applicable, or Not Available

ATTACHMENT 1

Remediation System Recovery Data

Sunoco, Inc. Philadelphia Refinery Remediation Program
Groundwater and LNAPL Recovery Systems Operational Data
AOI 1: Belmont Terminal

First Quarter 2013

Date	Ground Water Recovery			LNAPL Recovery	
	Total Recovery (gallons)	Recovery For Period (gallons)	Average Flow Rate (gpm)	Period Total (gallons)	Cumulative (gallons)
4-Jan-13	78,991,638	147,428	25.60	0.0	246,375
11-Jan-13	79,023,773	32,135	3.19	0.0	246,375
18-Jan-13	79,143,909	120,136	11.92	0.0	246,375
25-Jan-13	79,280,735	136,826	13.57	30.7	246,405
1-Feb-13	79,421,759	141,024	13.99	85.4	246,491
8-Feb-13	79,522,326	100,567	9.98	0.0	246,491
15-Feb-13	79,621,211	98,885	9.81	0.0	246,491
22-Feb-13	79,737,750	116,539	11.56	0.0	246,491
1-Mar-13	79,791,638	53,888	5.35	0.0	246,491
8-Mar-13	79,956,050	164,412	16.31	97.3	246,588
15-Mar-13	80,035,384	79,334	7.87	0.0	246,588
22-Mar-13	80,222,363	186,979	18.55	12.1	246,600
31-Mar-13	80,283,825	61,462	4.74	53.0	246,653

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallons per minute

The Belmont Terminal System consists of the Loading Rack System (RW-21, RW-22, RW-23, RW-24, and RW-25) and the Frontage Road System (RW-15 and RW-26 through RW-32). The Belmont System has 2 totalizers: one for the Loading Rack and one for Frontage Road.

On August 30, 2012, the Frontage Road System was turned off and will remain offline unless there are significant increases in LNAPL in the recovery wells. The wells were routinely gauged and no product was detected during the reporting period.

The Loading Rack System has product pumps in RW-22, RW-23, and RW-24 which are checked weekly and manually operated as recoverable product thicknesses accumulate in each well. Water pumps were active in RW-22 through RW-24 with the following exceptions. On January 4, the system was shut down so that a repair could be made to the system recovery line. A new steel fitting was installed on January 7 and the system was returned to service.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: Shunk Street Sewer Ventilation System and Biofilter Operational Data
Organic Vapor Concentrations

First Quarter 2013

Date	Flow Rate (CFM)	Sewer Air PID (ppm)	Total Flow PID (ppm)	Treatment Cell Effluent PID (ppm)			Treatment Cell Media Temperature (°F)		
				Cell #1	Cell #2	Cell #3	Cell #1	Cell #2	Cell #3
4-Jan-13	4950	0.3	0.3	0	0	0	58	58	58
10-Jan-13	4950	0	0	0	0	0	63	63	63
16-Jan-13	4950	0	0	0	0	0	56	56	56
23-Jan-13	4950	0	0	0	0	0	56	56	56
31-Jan-13	4950	0	0	0	0	0	60	60	60
7-Feb-13	4950	0	0	0	0	0	55	55	55
13-Feb-13	4950	0.1	0.1	0	0	0	56	56	56
21-Feb-13	4950	0.2	0.2	0	0	0	56	56	56
26-Feb-13	4950	0	0	0	0	0	55	55	55
7-Mar-13	4950	0.4	0.4	0	0	0	57	57	57
12-Mar-13	4950	0	0	0	0	0	58	58	58
22-Mar-13	4950	0.4	0.4	0	0	0	58	58	58
25-Mar-13	4950	0.1	0.1	0	0	0	63	63	63

NOTES:

CFM = cubic feet per minute

PID = photoionization detector

ppm = parts per million

°F = Degrees Fahrenheit

Sewer Air PID is a measurement taken from the Shunk Street Sewer air stream only.

The air stripper was taken off-line June 17, 2004; therefore the Total Flow PID is equal to the Sewer Air PID reading.

The system was operational for the reporting period.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: Shunk Street Sewer Biofilter System
pH Data

First Quarter 2013

Date	Leachate pH	Biofilter Treatment Cell - Soil pH		
		Cell 1	Cell 2	Cell 3
31-Jan-13	NA	6.13	6.27	6.19
26-Feb-13	NA	5.97	6.01	6.08
25-Mar-13	5.29	6.01	6.00	6.13

Notes:

Leachate recordings are collected on a quarterly basis.

Media pH recordings are collected on a monthly basis.

NA = Not applicable or no leachate available for which to record pH.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
AOI 1: 26th Street Sewer Area

First Quarter 2013

Date	Total Flow (gallons)	Period Total Flow (gallons)	Calculated System Flow Rate (gpm)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
4-Jan-13	39,904,155	0	0.00	NA	8,928.60
11-Jan-13	39,904,155	0	0.00	NA	8,929.60
18-Jan-13	39,904,155	0	0.00	NA	8,930.60
25-Jan-13	39,954,159	50,004	4.96	NA	8,931.60
1-Feb-13	39,978,606	24,447	2.43	NA	8,932.60
8-Feb-13	39,991,469	12,863	1.28	NA	8,933.60
15-Feb-13	40,067,467	75,998	7.54	NA	8,934.60
22-Feb-13	40,117,058	49,591	4.92	NA	8,935.60
1-Mar-13	40,146,058	29,000	2.88	NA	8,936.60
8-Mar-13	40,149,487	3,429	0.34	NA	8,937.60
15-Mar-13	40,209,250	59,763	5.93	NA	8,938.60
22-Mar-13	40,209,250	0	0.00	NA	8,939.60
31-Mar-13	40,230,663	21,413	1.65	NA	8,940.60

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallon per minute

The total flow and total LNAPL recovered includes historical totals from former recovery wells RW-400 through RW-406.

The 26th Street Sewer Area (26th Street North) Total Fluids Recovery System consists of 19 total fluids recovery wells which discharge directly to a benzene NESHAP controlled sewer; therefore, volume of recoverable LNAPL cannot be quantified. None of the 5 wells on CSX property were active during this reporting period due to absence of product.

Due to high iron content of the total fluids recovered, the pumps routinely become fouled and get hung up. During weekly visits, pumps are pulled, cleaned, and restarted regularly as needed. The system was operational for the reporting period although the flow meter was bypassed until it was replaced on January 18. The flow meter was inoperable on January 25, but could not be repaired because the bypass was frozen. The flow meter was removed, cleaned, and reinstalled on February 1. The manifold at RW-403 rusted and broke on February 26. Therefore, the system was shutoff until the 400-series wells were segregated from the main line and the system was restarted on March 7. The compressor was not operational on March 21 and was restarted. The compressor was not operational on March 26 and the system was left off for the annual gauging event.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: 26th Street & Packer Avenue Sewers Biofilter System
Historical Organic Vapor Concentrations

First Quarter 2013

Date	Biofilter Influent			Biofilter Effluent							
	Packer Ave. (ppm)	26 th Street (ppm)	ST-1 (Combined Influent) (ppm)	Cell-1N	Cell-1S	Cell-2N	Cell-2S	Cell-3N	Cell-3S	Cell-4N	Cell-4S
04-Jan-13	11.2	29.8	18.4	0.0	0.0	0.0	0.0	NA	NA	NA	NA
11-Jan-13	94.6	61.2	59.8	0.0	0.0	0.0	0.0	NA	NA	NA	NA
18-Jan-13	1.6	4.3	1.6	0.0	0.0	0.0	0.0	NA	NA	NA	NA
25-Jan-13	78.5	67.2	44.4	0.0	0.0	0.0	0.0	NA	NA	NA	NA
01-Feb-13	13.2	21.8	11.6	0.0	0.0	0.0	0.0	NA	NA	NA	NA
08-Feb-13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NA	NA	NA	NA
15-Feb-13	25.7	48.4	20.4	0.0	0.0	0.0	0.0	NA	NA	NA	NA
22-Feb-13	17.7	38.1	20.4	0.0	0.0	0.0	0.0	NA	NA	NA	NA
01-Mar-13	47.1	55.3	NM	0.0	0.0	0.0	0.0	NA	NA	NA	NA
08-Mar-13	178.2	223.7	NM	0.0	0.0	0.0	0.0	NA	NA	NA	NA
15-Mar-13	48.4	25.0	NM	0.0	0.0	0.0	0.0	NA	NA	NA	NA
22-Mar-13	38.1	47.3	39.6	0.0	0.0	0.0	0.0	NA	NA	NA	NA
31-Mar-13	39.6	36.6	20.9	0.0	0.0	0.0	0.0	NA	NA	NA	NA

NOTES: ppm: parts per million

Readings are collected using a ThermoEnvironmental Photoionization Detector (PID).

Beds 3 and 4 remain off for the reporting period as they are not currently needed for vapor treatment. The system was operational throughout the reporting period with the following exceptions.

On January 4, 2013, the system was not operational due to broken belts on the blower. The belts were replaced and the system was returned to service the same day. On February 28, the system building was found without power. The facility electricians determined that the breakers in a nearby substation were blown and the system was returned to service on March 11.

NA: Not applicable or not available

NM: Not measured

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 1: Shunk Street Sewer Biofilter System
pH Data

First Quarter 2013

Date	Leachate pH	Biofilter Treatment Cell - Soil pH		
		Cell 1	Cell 2	Cell 3
31-Jan-13	NA	6.13	6.27	6.19
26-Feb-13	NA	5.97	6.01	6.08
25-Mar-13	5.29	6.01	6.00	6.13

Notes:

Leachate recordings are collected on a quarterly basis.

Media pH recordings are collected on a monthly basis.

NA = Not applicable or no leachate available for which to record pH.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Groundwater and LNAPL Recovery System Operational Data
AOI 2: Pollock Street West End System

First Quarter 2013

Date	Period Total Flow (gallons)	Total Flow (gallons)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
2-Jan-13	77,796	9,042,685	116.5	46,492
7-Jan-13	172,151	9,214,836	74.6	46,566
14-Jan-13	226,142	9,440,978	221.1	46,787
18-Jan-13	119,767	9,560,745	88.0	46,875
22-Jan-13	108,050	9,668,795	53.3	46,929
25-Jan-13	70,550	9,739,345	17.9	46,947
30-Jan-13	107,960	9,847,305	21.9	46,969
4-Feb-13	0	9,847,305	0.0	46,969
11-Feb-13	241,740	10,089,045	203.3	47,172
19-Feb-13	227,690	10,316,735	110.9	47,283
27-Feb-13	300,160	10,616,895	132.6	47,415
4-Mar-13	47,480	10,664,375	195.8	47,611
11-Mar-13	189,300	10,853,675	70.8	47,682
18-Mar-13	188,760	11,042,435	98.3	47,780
26-Mar-13	66,170	11,108,605	122.7	47,903

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallon per minute

The total groundwater and total LNAPL recovery totals do not include historical totals from former Pollock Street Vertical System recovery wells. The West End system was started on February 23, 2012.

The system was operational throughout the reporting period with the following exceptions. The system was on high oil water separator alarm on January 2; system repairs were made and it was returned to service the same day. On January 7 the separator was cleaned and on January 11, the transfer pump was removed, cleaned, and reinstalled. On January 15, the pump from RW-122 was removed, cleaned, and moved to RW-126 due to increasing product thickness in RW-126. The system was shut-off from January 30 through February 4 due to a PES issue with the clarifier at the Point Breeze Bioplant. A pump was blowing air and the flow meter was cleaned and reinstalled on March 18. On March 26, the flow meter and probes were fouled and cleaned.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
AOI 2: Pollock Street Vertical Wells

First Quarter 2013

Date	RW-101			RW-102			RW-103		
	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	Average Flow Rate (gpm)	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	Average Flow Rate (gpm)	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	Average Flow Rate (gpm)
4-Jan-13	10	11,108,060	0.00	4,740	5,772,399	0.82	23,600	6,407,800	4.10
11-Jan-13	0	11,108,060	0.00	4,600	5,776,999	0.46	19,640	6,427,440	1.95
18-Jan-13	31,130	11,139,190	3.09	3,840	5,780,839	0.38	25,200	6,452,640	2.50
25-Jan-13	56,310	11,195,500	5.59	5,780	5,786,619	0.57	27,760	6,480,400	2.75
1-Feb-13	36,830	11,232,330	3.65	4,650	5,791,269	0.46	17,630	6,498,030	1.75
8-Feb-13	41,310	11,273,640	4.10	6,230	5,797,499	0.62	26,570	6,524,600	2.64
15-Feb-13	4,030	11,277,670	0.40	2,780	5,800,279	0.28	12,650	6,537,250	1.25
22-Feb-13	39,660	11,317,330	3.93	0	5,800,279	0.00	27,410	6,564,660	2.72
1-Mar-13	30,930	11,348,260	3.07	1,960	5,802,239	0.19	23,290	6,587,950	2.31
8-Mar-13	20,760	11,369,020	2.06	850	5,803,089	0.08	14,900	6,602,850	1.48
15-Mar-13	30,090	11,399,110	2.99	4,470	5,807,559	0.44	22,500	6,625,350	2.23
22-Mar-13	23,460	11,422,570	2.33	3,070	5,810,629	0.30	16,870	6,642,220	1.67
31-Mar-13	35,480	11,458,050	2.74	6,610	5,817,239	0.51	31,560	6,673,780	2.44

NOTES:

gpm: gallons per minute

The Pollock Street Sewer Area Vertical System (RW-101, RW-102, and RW-103) discharges total fluids directly to a benzene NESHAP controlled sewer; therefore, recovered LNAPL volume cannot be calculated. The reported volume recovered for total fluids accounts for the historical recovery for each system.

The vertical wells were operational for the reporting period with the following exceptions. On January 2, RW-101 was not operating properly. A new pump end was installed, the flow meter was cleaned, and it was returned to service on January 9. On January 14, the RW-102 flow meter was blocked; it was cleaned and returned to service on January 15. On February 11, the flow meters at RW-101 and RW-103 were inoperable. They were removed, cleaned/repaired, and reinstalled on February 12. On February 20, RW-102 was inoperable; the pump was replaced on February 21. On March 4, the RW-102 flow meter was not operating; it was cleaned and reinstalled on March 5. The vertical wells were shutoff March 14 and 15 for jetting of horizontal wells.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
AOI 2: Pollock Street Horizontal Wells

First Quarter 2013

Actual Dates in Period	Reporting Period (Internal)	Days in Period	HW-1 Days of Operation Within Period	HW-1 Water Recovered During Period (gallons)	HW-2 Days of Operation Within Period	HW-2 Water Recovered During Period (gallons)	HW-3 Days of Operation Within Period	HW-3 Water Recovered During Period (gallons)	Total Fluids Extracted During Period (gallons)	Total Fluids Extracted (gallons)	LNAPL Recovered During Period (gallons)
1/1/12 - 1/20/12	start 1Q2012	20	2	23,040	2	10,742	20	442,944	476,726	21,534,898	NA
12/24/11 - 1/20/12	Jan. 2012	28	10	115,200	10	53,712	28	620,122	789,034	21,534,898	NA
1/21/12 - 2/17/12	Feb. 2012	28	25	288,000	24	128,909	28	620,122	1,037,030	22,571,928	NA
2/18/12 - 3/16/12	March 2012	28	27	311,040	28	150,394	27	597,974	1,059,408	23,631,336	NA
3/17/12 - 3/30/12	end 1Q2012	14	13	149,760	14	75,197	14	310,061	535,018	24,166,354	NA
3/17/12 - 4/20/12	April 2012	35	34	391,680	35	187,992	34	753,005	1,332,677	24,964,013	NA
4/21/12 - 5/18/12	May 2012	28	27	311,040	28	150,394	28	620,122	1,081,555	26,045,568	NA
5/19/12 - 6/22/12	June 2012	35	33	380,160	32	171,878	23	509,386	1,061,424	27,106,992	NA
6/23/12 - 6/30/12	end 2Q2012	8	8	92,160	8	42,970	8	177,178	312,307	27,419,300	NA
6/23/12 - 7/20/12	July 2012	28	28	322,560	28	150,394	28	620,122	1,093,075	28,200,068	NA
7/21/12 - 8/24/12	Aug. 2012	35	35	403,200	35	187,992	35	775,152	1,366,344	29,566,412	NA
8/25/12 - 9/21/12	Sept. 2012	28	28	322,560	28	150,394	28	620,122	1,093,075	30,659,487	NA
9/22/12 - 9/30/12	end 3Q2012	9	9	103,680	9	48,341	9	199,325	351,346	31,010,832	NA
9/22/12 - 10/19/12	Oct. 2012	28	27	311,040	27	145,022	28	620,122	1,076,184	31,735,671	NA
10/20/12 - 11/16/12	Nov. 2012	28	26	299,520	28	150,394	28	620,122	1,070,035	32,805,706	NA
11/17/12 - 12/21/12	Dec. 2012	35	35	403,200	33	177,250	35	775,152	1,355,602	34,161,308	NA
12/22/12 - 12/31/12	end 4Q2012	10	9	103,680	10	53,712	10	221,472	378,864	34,540,172	NA
12/22/12 - 1/25/13	Jan. 2013	35	34	391,680	35	187,992	35	775,152	1,354,824	35,516,132	NA
1/26/13 - 2/22/13	Feb. 2013	28	28	322,560	28	150,394	24	531,533	1,004,486	36,520,618	NA
2/23/13 - 3/22/13	March 2013	28	26	299,520	26	139,651	28	620,122	1,059,293	37,579,911	NA
3/23/13 - 3/31/13	end 1Q2013	9	9	103,680	9	48,341	9	199,325	351,346	37,931,256	NA

NOTES:

Pump tests were performed in March 2011 for the horizontal wells so that recovered volumes could be estimated based on flow rates and system up-time, beginning in the second quarter of 2011. HW-1 estimated flow is 8 gallons per minute (gpm), HW-2 is 3.73 gpm, and HW-3 is 15.38 gpm.

HW-1 and HW-2 were operational for the reporting period except for March 14 and 15 for line jetting.

HW-3 was operational for the reporting period.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Groundwater and LNAPL Recovery System Operational Data
AOI 6: 27 Pump House

First Quarter 2013

Date	Water Recovered During Period (gallons)	Total Water Extracted (gallons)	Average Flow Rate (gpm)	LNAPL Recovered During Period (gallons)	Total LNAPL Recovered (gallons)
04-Jan-13	0	11,134,675	0.00	1.50	12,883.70
11-Jan-13	0	11,134,675	0.00	0.50	12,884.20
18-Jan-13	0	11,134,675	0.00	0.75	12,884.95
25-Jan-13	0	11,134,675	0.00	0.50	12,885.45
01-Feb-13	0	11,134,675	0.00	0.50	12,885.95
08-Feb-13	0	11,134,675	0.00	0.50	12,886.45
15-Feb-13	0	11,134,675	0.00	2.00	12,888.45
22-Feb-13	0	11,134,675	0.00	1.75	12,890.20
01-Mar-13	0	11,134,675	0.00	1.50	12,891.70
08-Mar-13	0	11,134,675	0.00	1.00	12,892.70
15-Mar-13	0	11,134,675	0.00	0.00	12,892.70
22-Mar-13	0	11,134,675	0.00	1.50	12,894.20
31-Mar-13	0	11,134,675	0.00	2.00	12,896.20

NOTES:

LNAPL: Light Non-Aqueous Phase Liquid

gpm: gallons per minute

The system was turned off September 20, 2010 due to absence of recoverable product. Recovery wells B-124, B-132, B-137, B-139, B-142, B-143, and B-147 contained absorbent socks. During the reporting period, wells were routinely gauged and the socks were replaced when necessary. LNAPL recovery volumes are recorded using a graduated beaker and recovered product is transferred to the system holding tank. Passive remediation will continue until no measurable product is observed or until recoverable thicknesses of LNAPL return to the recovery wells.

Sunoco, Inc. Philadelphia Refinery Remediation Program
Total Fluids Recovery System Operational Data
3 Separator System

First Quarter 2013

Date	Total Flow (gallons)	Period Total Flow (gallons)	Calculated System Flow Rate (gpm)	LNAPL Recovered in Period (gallons)	Total LNAPL Recovered (gallons)
01/03/2013	2,350,685	92,700	21.46	186.1	11,993.6
01/07/2013	2,402,585	51,900	9.01	28.3	12,021.9
01/18/2013	2,536,685	134,100	8.47	266.8	12,288.7
01/25/2013	2,622,085	85,400	8.47	129.6	12,418.3
01/31/2013	2,692,485	70,400	8.15	79.5	12,497.7
02/05/2013	2,754,085	61,600	8.56	69.2	12,567.0
02/14/2013	2,861,685	107,600	8.30	126.9	12,693.8
02/19/2013	2,932,185	70,500	9.79	67.8	12,761.6
02/28/2013	3,042,985	110,800	8.55	327.5	13,089.2
03/04/2013	3,100,285	57,300	9.95	111.2	13,200.4
03/11/2013	3,185,285	85,000	8.43	246.4	13,446.8
03/19/2013	3,286,585	101,300	8.79	804.7	14,251.5
03/20/2013	3,290,085	3,500	2.43	1,045.8	15,297.2
03/20/2013	NA	NA	NA	847.8	16,145.0
03/21/2013	3,297,285	7,200	5.00	1,049.3	17,194.4
03/21/2013	NA	NA	NA	487.4	17,681.7
03/22/2013	3,315,705	18,420	12.79	837.4	18,519.1
03/22/2013	NA	NA	NA	407.6	18,926.7
03/23/2013	NA	NA	NA	683.4	19,610.1
03/23/2013	NA	NA	NA	256.6	19,866.7
03/23/2013	NA	NA	NA	160.4	20,027.1
03/24/2013	NA	NA	NA	683.4	20,710.5
03/24/2013	NA	NA	NA	319.5	21,029.9
03/25/2013	3,358,985	43,280	30.06	562.5	21,592.4
03/25/2013	NA	NA	NA	109.5	21,701.9
03/26/2013	3,373,385	14,400	10.00	385.2	22,087.1
03/26/2013	NA	NA	NA	94.0	22,181.1
03/27/2013	3,387,685	14,300	9.93	438.7	22,619.9
03/27/2013	NA	NA	NA	178.6	22,798.4
03/28/2013	3,401,585	13,900	9.65	346.6	23,145.0
03/28/2013	NA	NA	NA	121.7	23,266.7
03/29/2013	3,415,085	13,500	9.38	256.6	23,523.2
03/29/2013	NA	NA	NA	111.5	23,634.8
03/30/2013	NA	NA	NA	197.3	23,832.1
03/30/2013	NA	NA	NA	109.5	23,941.7
03/31/2013	NA	NA	NA	178.6	24,120.3
03/31/2013	NA	NA	NA	65.3	24,185.5

Notes:

gpm: gallons per minute

LNAPL: Light Non-Aqueous Phase Liquid

The 3 Separator System is a hydraulic control system constructed of ten recovery wells which was started on August 23, 2012. LNAPL and water are extracted using pneumatic submersible pumps and total fluids pass through an oil water separator. Water is discharged to an onsite process sewer and LNAPL is recovered in a tank and recycled by the refinery. Groundwater and product recovery totals provided include system startup through the end of this reporting period.

The system was operational for the reporting period. On March 19, the system shut down on tank full alarm. The holding tank was evacuated and the system was restarted. The system was placed on twice daily holding tank evacuations until the leak (not associated with the remediation system) was found on April 4. The holding tank is being gauged daily and evacuated as needed until PES completes repairs to their line.

Sunoco, Inc. Philadelphia Refinery Remediation Program
AOI 8: Jackson Street Sewer Water Curtain

First Quarter 2013

Date	PID readings (ppm)			Comments
	Blower	Water Curtain	Interceptor Chamber	
04-Jan-13	NA	0.0	0.0	
11-Jan-13	NA	0.0	0.0	not operational
18-Jan-13	NA	0.0	0.0	
25-Jan-13	NA	0.0	0.0	
01-Feb-13	NA	0.0	0.0	
08-Feb-13	NA	0.0	0.0	
15-Feb-13	NA	0.0	0.0	
22-Feb-13	NA	0.0	0.0	
01-Mar-13	NA	0.0	0.0	
08-Mar-13	NA	0.0	0.0	
15-Mar-13	NA	0.0	0.0	
22-Mar-13	NA	0.0	0.0	
31-Mar-13	NA	0.0	0.0	

Notes:

ppm: parts per million

NA: Not Available (PID readings are not collected at the blower.)

The totalizer was removed on December 11, 2009.

The system was operational throughout the reporting period except on January 8, the system was found inoperable. PES turned off the North Yard fire water to repair a leak. The leak was repaired and the water curtain was returned to service on January 18, 2013.

ATTACHMENT 2
26th Street South (S-50 Area) Report



**PERFORMANCE MONITORING AND QUARTERLY UPDATE
26TH STREET SOUTH (AOI-1)**

**SUNOCO, INC (R&M)
PHILADELPHIA REFINERY
PHILADELPHIA, PA**

April 2013

Prepared for:

**Sunoco, Inc. (R&M)
3144 Passyunk Avenue
Philadelphia, Pennsylvania 19145**

Prepared by:

**AQUATERRA TECHNOLOGIES, INC.
P.O. Box 744
West Chester, Pennsylvania 19381**

Prepared By:

A handwritten signature in black ink, appearing to read "Tiffani L. Doerr".

Tiffani L. Doerr, P.G.
Senior Hydrogeologist

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FIGURES

- Figure 1 Groundwater Monitoring Map
 Figure 2 Injection Well Location Map

TABLE

- Table 1 Historic Groundwater Gauging and Sampling Summary
 Table 2 Summary of Field Monitoring Parameters
 Table 3a DO Data for Shallow Injection Wells
 Table 3b DO Data for Deep Injection Wells
 Table 4a ORP Data for Shallow Injection Wells
 Table 4b ORP Data for Deep Injection Wells

APPENDICES

- Attachment A Groundwater Laboratory Analytical Data
 Attachment B DO Graphs for System Injection Points
 Attachment C DO, Benzene and Groundwater Elevation vs Time Graphs



1.0 INTRODUCTION

The information contained in this report is intended to be included as an Attachment to the Quarterly Remediation Status Report for the Philadelphia Refinery and Belmont Terminal prepared by Stantec. The area investigated by Aquaterra and summarized in this report includes the southern portion of AOI-1, also known as the #2 Tank Farm or the 26th Street South area. Historic sampling of groundwater in this area had been sporadic; however, over the course of the sampling history relatively high occurrences of benzene have been reported. Therefore, Aquaterra has been performing quarterly sampling of select monitoring wells across the area to provide further definition of the extent of the light non-aqueous phase liquids (LNAPL) and dissolved phase constituents of concern (COCs) in groundwater. This report also provides a summary of the remediation system operation, maintenance, and sampling activities.

2.0 QUARTERLY GROUNDWATER SAMPLING

2.1 Sampling Methodology

On 15 January, select monitoring wells within the 26th Street South study area were gauged and sampled as part of a quarterly groundwater monitoring program. Prior to sampling, depth to water measurements were collected for use in calculating groundwater elevations and for the generation of a groundwater gradient map (**Figure 1**). Depths to water ranged from 20.28 (S-230) to 24.61 (S-210) feet below top of casing. The groundwater gradient map illustrates groundwater flow generally toward the east. LNAPL was measured in three wells during the gauging event. Well S-210 measured an LNAPL thickness of 0.04 feet, S-226 measured an LNAPL thickness of 0.02 feet, and S-231 measured a thickness of 0.01 feet; therefore samples were not collected from these wells for laboratory analysis. Groundwater samples were collected from wells S-50, S-230, and S-232. Groundwater gauging information collected as part of the groundwater sampling event is summarized in **Table 1**.

Sampling of wells was performed using the three well volume purge protocol for groundwater sampling using a whale pump. Samples were submitted to Lancaster Laboratories, Inc. (Lancaster) for analysis of the following COCs: benzene, toluene, ethylbenzene, xylenes (BTEX), and methyl tertiary-butyl ether (MTBE) via US EPA Method 8260B. Laboratory analytical data and chain of custody are included as **Attachment A**.

2.2 Sampling Results

Laboratory data indicate that benzene was reported above the Pennsylvania Department of Environmental Protection (PADEP) Act 2 Statewide Health Standard (SHS) Medium Specific Concentration (MSC) in the three wells that were sampled. All other compounds were reported below their respective SHS MSCs. Laboratory data are summarized in **Table 1**.

3.0 REMEDIATION ACTIVITIES

3.1 Oxygen Injection System

Between January and March 2009, 54 nested injection points within 27 well boreholes (at each well location there is one shallow and one deep) were installed as part of the oxygen injection remediation system. Deep injection points range in depth from 29 to 41 feet below grade, and shallow injection points range in depth from 25 to 33.5 feet below grade, each with two feet of slotted screen. The nested configuration was utilized due to aquifer heterogeneity and the presence of clay layers which may inhibit the movement of oxygen to the impacted zones. The goal of the remediation system is to provide a barrier against offsite migration of the COCs within the aquifer.

Four ‘banks’ of wells were set to inject into multiple wells at a time so that oxygen is pulsed into the aquifer. This pulsing of the system aids in transfer of oxygen from the vapor to dissolved phase, and the low flow rate allows for maximum dissolved oxygen (DO) saturation without causing contaminant volatilization. The system was initially set up to only inject within the deep points (except at IW-01, where there was blockage in the deep point); however, due to lower than projected target DO concentrations in surrounding monitoring wells, the system was adjusted on 18 November 2009 to inject into the shallow points so that DO injection was being performed closer to the monitoring well screen intervals. Initially, injection wells IW-17, IW-18 and IW-19 remained as deep injection points due to the deeper well screen construction of S-232. However, on 6 April 2012, injection was switched from IW-18D to IW-18S due to blockage in the deep point. On 14 January 2010, IP-25 was switched back to the deep well due to loss of pressure in the shallow well. Injection well locations are illustrated on **Figure 2**.

3.2 Operation and Maintenance

Routine operation and maintenance (O&M) activities are generally conducted by Aquaterra on a monthly basis, during which Aquaterra records system operation information including system run time and operating pressures. Adjustments are made during each visit to maintain optimal operating conditions. Injection pressures are measured at each point during these visits and adjusted to approximately 30 standard cubic feet per hour (scfh). Oxygen purity is also measured during each visit. O&M visits were conducted on 17 January 2013, 27 February 2013, and 14 March 2013. During the January visit the compressor was down due to an overload alarm. The system drier was manually bypassed during this visit because of historic shut-downs due to drier issues. During the February visit the system was down again due to water in the air tank. Permanent repairs need to be made to the air drier/cooler; therefore, power to the system was turned off until these repairs can be made. During the March visit, the drier was removed and taken offsite for repair.

DO and ORP measurements are also collected during each O&M visit from injection points as well as nearby monitoring wells (S-50, S-210, S-226, S-230, S-231 and S-232). The pH, depth to water, and thickness of LNAPL, if present, are also recorded from the monitoring wells proximal to the system (**Table 2**). During the January monthly O&M visit, LNAPL was recorded in wells S-210 (0.12), S-226 (0.48), and S-231 (0.24). During the February monthly O&M visit, LNAPL was recorded in well S-210 only, at a thickness of 0.01 feet.

Due to the large number of injection points, half of the points are measured for DO and ORP concentrations during each by-weekly visit. DO data are presented in **Tables 3a and 3b** for the shallow and deep injection points, respectively. ORP data are presented in **Tables 4a and 4b** for the shallow and deep injection points, respectively. The DO data is also presented graphically for the shallow and deep wells. A ‘goal line’ of 2 milligrams per liter (mg/L) is presented on the graphs to illustrate where aerobic conditions exist. The 30 mg/L line is also illustrated on the graphs for each well as this is the goal concentration for wells in which oxygen is being injected. These graphs are included in **Attachment B**.

3.3 Annual Groundwater Sampling

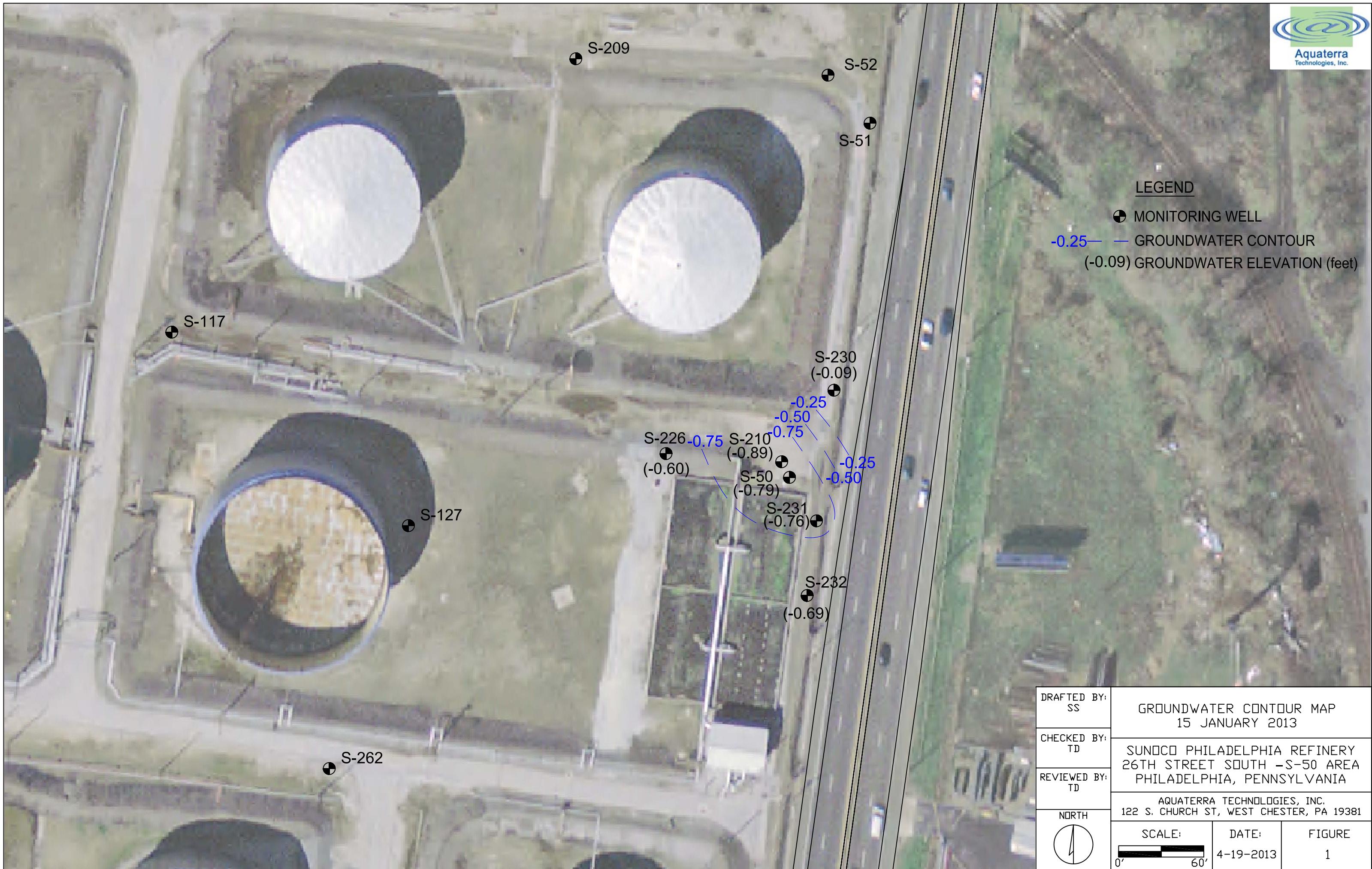
In addition to the sampling activities summarized in Section 2.1, six groundwater monitoring wells proximal to the remediation system are sampled for additional parameters to aid in determining if aerobic conditions are maintained and if there is a reduction in the benzene concentrations and other COCs in the surficial aquifer. The select wells are sampled for natural attenuation parameters and microbial analyses. Generally when monitoring for these parameters, wells upgradient of the plume, within the plume and downgradient of the plume are monitored so that spatial analysis of the results can be performed. However, as the system provides a barrier along the downgradient property boundary, no downgradient wells are available for monitoring. Therefore, the following wells are sampled to provide information both within and outside of the plume, as defined by the high benzene concentrations. The wells include: S-50, S-52, S-117, S-226, S-231, and S-232.

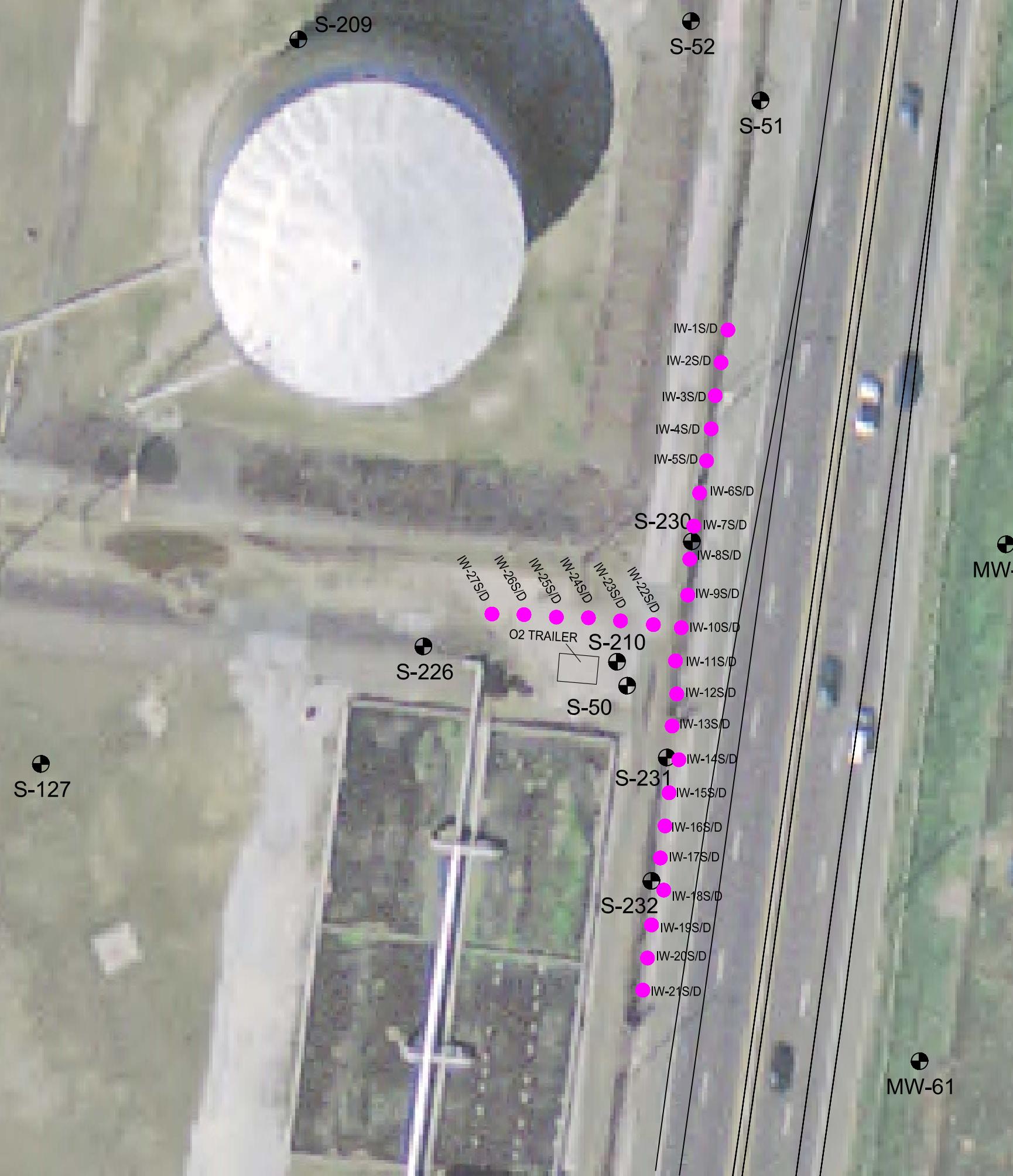
The wells were initially sampled on a quarterly basis; however, the quarterly sampling was reduced to an annual schedule. The wells were last sampled during the second quarter of 2012. Sample parameters include: DO, ORP, pH, conductivity, and temperature (all with field probe using flow-through cell); carbon dioxide (CO₂) using a field meter; alkalinity, ferrous iron, nitrate/nitrite, sulfate, total dissolved solids (TDS), total organic carbon (TOC), total inorganic carbon (TIC), biochemical oxygen demand (BOD), and hydrocarbon degrading bacteria including heterotrophic plate count via laboratory analyses.

In addition to the annual sampling, some of these wells are monitored for DO, ORP, and pH during the O&M visits as noted in Section 3.2. These field parameters are provided in **Table 2**. Graphs were generated illustrating the natural log of benzene concentration, versus groundwater elevation and DO concentration in each of the six wells nearest the remediation system (**Attachment C**). Product thicknesses are also added to these graphs since field measurements cannot be collected in the presence of LNAPL.

3.4 Future Sampling Activities

The quarterly schedule of groundwater sampling will continue for the wells noted in Section 2.1. The select wells utilized for monitoring of attenuation parameters and microbial analysis (as discussed in Section 3.3) will continue to be sampled on an annual basis. They will be sampled again in the second quarter of 2013. As noted in the previous report, Stantec continues to monitor and sample select wells along the property boundary as part of their annual perimeter sampling program, which includes wells S-41, S-43, S-44, S-50, S-51, S-226, and S-232.





LEGEND

- MONITORING WELL
- INJECTION POINT LOCATION

DRAFTED BY:
BB

CHECKED BY:
TD

REVIEWED BY:
TD

NORTH

OXYGEN INJECTION WELL LOCATION
MAP

SUNOCO PHILADELPHIA REFINERY
26TH STREET SOUTH - S-50 AREA
PHILADELPHIA, PENNSYLVANIA

AQUATERRA TECHNOLOGIES, INC.
122 S. CHURCH ST, WEST CHESTER, PA 19381

SCALE: 1"=50' DATE: 4-27-2009 FIGURE 2

 0' 50'

TABLE 1
undwater Gauging and Sampling Summary
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



TABLE 1
Groundwater Gauging and Sampling Summary
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	Total Depth	SPH Thickness	GW Elev	Benzene ug/l	Toluene ug/l	Ethyl-benzene ug/l	Total Xylenes ug/l	MTBE ug/l	Isopropyl-benzene ug/l	Naphthalene ug/l	1,2-Dibromoethane (EDB) ug/l	1,2-Dichloroethane (EDC) ug/l	Dissolved Lead mg/l	Phenanthrene ug/l	Chrysene ug/l	Pyrene ug/l	Sulfate mg/l	Nitrate Nitrogen mg/l	Nitrite Nitrogen mg/l	Organic carbon (total) mg/l	Inorganic Carbon (total) mg/l	Total Carbon mg/l	Alkalinity (pH 4.5) mg/l as CaCO3	Alkalinity (pH 8.3) mg/l as CaCO3	Dissolved solids (total) mg/l	Ferrous Iron mg/l	Biochemical Oxygen Demand mg/l	HC Bacteria In Water cfu/ml	Heterotrophic Plate Count cfu/ml	
						DTW	DTP	Benzene ug/l	Toluene ug/l	Ethyl-benzene ug/l	Total Xylenes ug/l	MTBE ug/l	Isopropyl-benzene ug/l	Naphthalene ug/l	1,2-Dibromoethane (EDB) ug/l	1,2-Dichloroethane (EDC) ug/l	Dissolved Lead mg/l	Phenanthrene ug/l	Chrysene ug/l	Pyrene ug/l	Sulfate mg/l	Nitrate Nitrogen mg/l	Nitrite Nitrogen mg/l	Organic carbon (total) mg/l	Inorganic Carbon (total) mg/l	Total Carbon mg/l	Alkalinity (pH 4.5) mg/l as CaCO3	Alkalinity (pH 8.3) mg/l as CaCO3	Dissolved solids (total) mg/l	Ferrous Iron mg/l	Biochemical Oxygen Demand mg/l	HC Bacteria In Water cfu/ml
S-117	8/6/2008	18.41	29	17.20	-	1.21	7,400	43	900	69	89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/25/2009			18.12	-	0.29	250	6	<1	16	20	12	9	<0.030	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	5/7/2009			17.58	-	0.83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	78,000	
	6/23/2009			17.34	-	1.07	300	6	74	12	31	10	20	<0.029	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,800
	9/16/2009			16.88	-	1.53	370	<5	14	9	6	<10	<5	<0.029	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,900	
	12/10/2009			16.29	-	2.12	47	2	49	3	2	7	14	<0.029	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16,000	
	3/17/2010			16.87	-	1.54	120	8	89	8	16	12	26	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	230,000	
	6/1/2010			16.52	-	1.89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	780,000	
	3/14/2011			17.84	-	0.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	5/16/2011			17.20	-	1.21	27	25	27	7	28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	880,000	
	7/21/2011			17.34	-	1.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	3/2/2012			17.25	-	1.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	6/18/2012			17.54	-	0.87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	8/9/2012			17.75	-	0.66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	10/18/2012			17.75	-	0.66	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
S-118	6/11/2008	17.90	30	17.60	-	0.30	770	28	170	100	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
	3/27/2009			18.34	-	0.44	260	15	64	79	10	19	8	<0.030	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	6/23/2009			17.72	-	0.18	570	18	69	94	15	21	9	<0.029	NA	<5	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	9/16/2009			17.22	-	0.68	84	5	74	29	1	13	11	<0.029	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	12/9/2009			16.54	-	1.36	440	33	99	200	4	14	16	<0.029	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	6/18/2012			17.81	-	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
S-127	6/11/2008	17.10	32	16.43	-	0.67	2,100	93	360	220	820	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	3/27/2009			17.28	-	0.18	380	22	31	25	270	30	11	<0.030	NA	<10	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	6/23/2009			16.55	-	0.55	130	48	42	49	410	79	<50	<0.029	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	9/16/2009			16.10	-	1.00	1,700	30	110	67	300	48	32	<0.030	NA	<1	<1.0	<5	<5	<5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
	12/10/2009			15.91	-	1.19	890	76	320	210	660	61	62</td																			

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conductivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-50	3/23/09	22.48	23.08	-	-	-0.60	NM	0.71	-69.4	NM	NM	7.63
	4/1/09	NM	-	-	-	NM	NM	1.25	-49	NM	NM	NM
	4/15/09	NM	-	-	-	NM	NM	3.05	-55	NM	NM	NM
	4/22/09	NM	-	-	-	NM	NM	NM	-50	NM	NM	NM
	5/7/09	22.62	-	-	-0.14	NM	1.58	-66	NM	512		6.3
	5/21/09	NM	-	-	-	NM	NM	1.97	NM	NM	NM	NM
	6/4/09	NM	-	-	-	NM	NM	0.85	-61	NM	NM	NM
	6/23/09	22.33	-	-	0.15	NM	0.30	-116.7	0.920	280		6.52
	7/8/09	22.49	-	-	-0.01	NM	0.70	-114	NM	NM		6.2
	7/21/09	22.62	-	-	-0.14	NM	0.67	-128	NM	NM		6.3
	8/4/09	22.78	-	-	-0.30	NM	1.03	-136	NM	NM		6.6
	8/19/09	22.39	-	-	0.09	NM	0.70	-119	NM	NM		6.5
	9/9/09	22.09	-	-	0.39	NM	1.01	-116	NM	NM		7.0
	9/16/09	22.14	-	-	0.34	17.60	0.21	-146.4	1.016	452		6.75
	9/23/09	22.03	-	-	0.45	NM	1.14	-112	NM	NM		6.6
	10/7/09	22.75	-	-	-0.27	NM	1.07	-128	NM	NM		6.6
	10/22/09	23.06	-	-	-0.58	NM	1.39	-109	NM	NM		6.6
	11/18/09	22.98	-	-	-0.50	NM	1.45	-95	NM	NM		6.6
	11/25/09	22.84	-	-	-0.36	NM	NM	NM	NM	NM		NM
	12/2/09	22.90	-	-	-0.42	NM	1.05	-89	NM	NM		6.50
	12/10/09	21.29	-	-	1.19	17.11	1.12	-96.5	0.909	515		6.76
	12/16/09	22.94	-	-	-0.46	NM	1.00	-91.0	NM	NM		6.7
	12/30/09	22.79	-	-	-0.31	NM	5.56	-79.0	NM	NM		6.7
	1/14/10	22.78	-	-	-0.30	NM	1.32	-133	NM	NM		6.7
	1/28/10	22.67	-	-	-0.19	NM	0.97	-131	NM	NM		6.7
	3/4/10	22.60	-	-	-0.12	NM	2.02	-130	NM	NM		6.8
	3/17/10	22.40	-	-	0.08	18.07	0.14	-134.7	1.039	406		6.9
	3/25/10	22.33	-	-	0.15	NM	1.41	-122	NM	NM		7.0
	4/15/10	22.19	-	-	0.29	NM	1.81	-117	NM	NM		6.8
	4/29/10	22.30	-	-	0.18	NM	2.05	-134	NM	NM		6.9
	5/20/10	22.47	-	-	0.01	NM	2.42	-130	NM	NM		7.2
	6/1/10	22.49	-	-	-0.01	27.23	0.29	-159.3	1.068	304		7.0
	6/3/10	22.52	-	-	-0.04	NM	2.25	-89	NM	NM		6.8
	6/17/10	22.50	-	-	-0.02	NM	1.70	-100	NM	NM		6.9
	7/13/10	22.59	-	-	-0.11	NM	1.21	-122	NM	NM		6.8
	7/29/10	22.50	-	-	-0.02	NM	2.72	-58	NM	NM		7.5
	8/12/10	22.57	-	-	-0.09	NM	2.29	-49	NM	NM		8.1
	8/26/10	22.59	-	-	-0.11	NM	3.04	-46	NM	NM		8.0
	9/9/10	22.61	-	-	-0.13	NM	9.40	24	NM	NM		8.9
	9/23/10	22.88	-	-	-0.40	NM	2.39	-50	NM	NM		7.2
	10/7/10	22.78	-	-	-0.30	NM	4.22	-14	NM	NM		6.7
	10/28/10	22.83	-	-	-0.35	NM	3.35	-67	NM	NM		6.9
	11/9/10	22.84	-	-	-0.36	NM	NM	NM	NM	NM		NM
	11/12/10	22.96	-	-	-0.48	NM	3.70	-69	NM	NM		7.7
	11/23/10	22.82	-	-	-0.34	NM	6.48	-65	NM	NM		7.3
	12/16/10	23.13	-	-	-0.65	NM	4.58	-17	NM	NM		7.7
	12/30/10	23.29	-	-	-0.81	NM	4.02	-8	NM	NM		7.5
	1/14/11	23.31	-	-	-0.83	NM	3.81	-43	NM	NM		7.0
	2/10/11	23.26	-	-	-0.78	NM	3.18	-73	NM	NM		7.1
	3/9/11	23.15	-	-	-0.67	NM	3.96	-95	NM	NM		7.4
	3/14/11	22.98	-	-	-0.50	17.58	3.29	-55.1	0.82	NM		6.9
	4/21/11	22.79	-	-	-0.31	NM	9.08	-49.5	NM	NM		7.3
	5/16/11	22.58	-	-	-0.10	17.40	7.14	-80.1	0.255	NM		7.4
	5/19/11	22.56	-	-	-0.08	NM	4.71	-69	NM	NM		6.7
	6/16/11	22.73	-	-	-0.25	NM	4.72	-42	NM	NM		6.4
	7/21/11	22.89	-	-	-0.41	NM	3.10	-9.9	NM	NM		5.8
	8/17/11	22.94	-	-	-0.46	NM	1.81	-5	NM	NM		6.7
	9/22/11	21.82	-	-	0.66	NM	2.53	-15	NM	NM		7.9
	10/27/11	21.74	-	-	0.74	NM	NM	NM	NM	NM		NM
	11/28/11	22.17	-	-	0.31	NM	4.02	70	NM	NM		7.7
	12/21/11	21.87	-	-	0.61	17.93	2.08	54	0.35	NM		6.9
	1/26/12	22.07	-	-	0.41	NM	1.48	-162	NM	NM		6.7
	2/29/12	22.58	-	-	-0.10	NM	3.85	55.1	NM	NM		6.7
	3/16/12	22.51	-	-	-0.03	NM	5.14	-40.4	NM	NM		7.6
	4/6/12	22.79	-	-	-0.31	NM	3.60	22.8	NM	NM		7.1
	5/15/12	22.84	-	-	-0.36	NM	4.81	-34.7	NM	NM		6.92
	6/14/12	22.96	-	-	-0.48	NM	0.90	-25.0	NM	NM		6.35
	6/18/12	22.96	-	-	-0.48	18.27	4.26	-130.0	NM	NM		6.76
	7/16/12	23.30	-	-	-0.82	NM	2.20	-88.9	NM	NM		6.36
	8/8/12	23.20	-	-	-0.72	NM	5.47	-34.2	NM	NM		6.45
	9/11/12	23.12	-	-	-0.64	NM	7.93	-11.8	NM	NM		7.03
	11/27/12	23.19	-	-	-0.71	NM	8.71	-38.6	NM	NM		6.91
	12/31/12	23.38	-	-	-0.90	NM	15.04	50.4	NM	NM		8.01
	1/17/13	23.49	-	-	-1.01	NM	1.41	5.5	NM	NM		6.62
	2/27/13	23.15	-	-	-0.67	NM	5.74	120.0	NM	NM		NM
S-52	3/25/09	23.54	23.90	-	-	-0.36	NM	0.18	-94.3	NM	NM	NM
	5/7/09	23.52	-	-	0.02	NM	NM	NM	504			NM
	6/22/09	23.12	-	-	0.42	NM	0.33	-116.2	0.873	336		6.62
	9/16/09	22.76	-	-	0.78	15.96	0.33	-131.5	0.880	460		6.81
	12/10/09	22.45	-	-	1.09	14.61	0.25	-135.9	0.878	312		6.89
	3/17/10	22.38	-	-	1.16	15.15	0.65	-133.8	0.894	356		6.9
	6/1/10	22.41	-	-	1.13	22.2	6.57	-84.6	0.977	294		7.07
	3/14/11	23.49	-	-	0.05	NM	NM	NM	NM	NM		NM
	5/16/11	22.91	-	-	0.63	15.18	3.66	-7.50	0.450	NM		6.79
	12/21/11	22.27	-	-	1.27	NM	NM	NM	NM	NM		NM
	6/18/12	23.30	-	-	0.24	NM	NM	NM	NM	NM		NM

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp ('C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-117	3/25/09	18.41	18.12	-	-	0.29	NM	0.25	-229.9	NM	NM	NM
	5/7/09		17.58	-	-	0.83	NM	NM	NM	9,999	288	6.33
	6/23/09		17.34	-	-	1.07	NM	0.25	-98.3	0.521	319	6.57
	9/16/09		16.88	-	-	1.53	17.75	0.50	-101.2	0.236	2,064	6.78
	12/10/09		16.29	-	-	2.12	13.48	0.28	-97.5	0.215	3,783	6.53
	3/17/10		16.87	-	-	1.54	16.87	0.23	-112.6	0.552	293	6.76
	6/1/10		16.52	-	-	1.89	18.97	1.70	-92.2	1.087	NM	NM
	3/14/11		17.84	-	-	0.57	NM	NM	NM	NM	NM	NM
	5/16/11		17.20	-	-	1.21	15.54	3.80	-11.30	0.355	NM	6.38
	12/21/11		16.66	-	-	1.75	NM	NM	NM	NM	NM	NM
	6/18/12		17.54	-	-	0.87	NM	NM	NM	NM	NM	NM
S-210	3/23/09	23.69	24.49	-	-	-0.80	NM	0.47	-48.8	NM	NM	7.17
	4/1/09		NM	-	-	NM	NM	1.57	-88.0	NM	NM	NM
	4/15/09		NM	-	-	NM	NM	4.02	-53.0	NM	NM	NM
	4/22/09		NM	-	-	NM	NM	2.04	-64.0	NM	NM	NM
	5/7/09		24.08	-	-	-0.39	NM	0.90	-46.00	NM	NM	NM
	5/21/09		NM	-	-	NM	NM	0.83	NM	NM	NM	NM
	6/4/09		NM	-	-	NM	NM	0.58	-72.00	NM	NM	NM
	6/23/09		23.71	-	-	-0.02	NM	1.16	-82.0	NM	NM	NM
	7/8/09		23.69	-	-	0.00	NM	0.95	-118.0	NM	NM	6.3
	7/21/09		23.79	-	-	-0.10	NM	1.86	-89.0	NM	NM	6.1
	8/4/09		23.82	23.79	0.03	-0.11	NM	NM	NM	NM	NM	NM
	8/19/09		23.65	23.62	0.03	0.06	NM	NM	NM	NM	NM	NM
	9/9/09		23.30	23.29	0.01	0.40	NM	NM	NM	NM	NM	NM
	9/16/09		23.38	-	-	0.31	NM	NM	NM	NM	NM	NM
	9/23/09		23.29	23.20	0.09	0.47	NM	NM	NM	NM	NM	NM
	10/7/09		23.88	23.79	0.09	-0.12	NM	NM	NM	NM	NM	NM
	10/22/09		24.36	24.24	0.12	-0.58	NM	NM	NM	NM	NM	NM
	11/25/09		24.07	-	-	-0.38	NM	NM	NM	NM	NM	NM
	12/2/09		24.11	-	-	-0.42	NM	1.54	-92	NM	NM	6.5
	12/10/09		23.48	-	-	0.21	NM	NM	NM	NM	370	NM
	12/16/09		24.11	-	-	-0.42	NM	1.63	-88	NM	NM	6.6
	12/30/09		23.97	-	-	-0.28	NM	1.04	-76	NM	NM	6.6
	1/14/10		23.90	-	-	-0.21	NM	1.55	-94	NM	NM	6.5
	1/28/10		23.80	-	-	-0.11	NM	0.73	-119	NM	NM	6.7
	3/4/10		23.78	-	-	-0.09	NM	1.55	-110	NM	NM	6.7
	3/17/10		23.60	-	-	0.09	NM	NM	NM	NM	NM	NM
	3/25/10		23.49	-	-	0.20	NM	1.78	-86	NM	NM	6.6
	4/15/10		23.38	-	-	0.31	NM	1.81	-111	NM	NM	6.7
	4/29/10		23.49	-	-	0.20	NM	2.19	-109	NM	NM	6.8
	5/20/10		23.65	-	-	0.04	NM	2.34	-116	NM	NM	6.9
	6/1/10		23.68	-	-	0.01	NM	NM	NM	289	NM	NM
	6/3/10		23.68	-	-	0.01	NM	1.14	-106	NM	NM	6.8
	6/17/10		23.71	-	-	-0.02	NM	1.89	-101	NM	NM	6.8
	7/13/10		24.27	23.58	0.69	-0.06	NM	NM	NM	NM	NM	NM
	7/29/10		24.25	23.42	0.83	0.06	NM	NM	NM	NM	NM	NM
	8/12/10		24.39	23.50	0.89	-0.03	NM	NM	NM	NM	NM	NM
	8/26/10		24.34	23.61	0.73	-0.10	NM	NM	NM	NM	NM	NM
	9/9/10		24.39	23.59	0.80	-0.10	NM	NM	NM	NM	NM	NM
	9/23/10		24.74	23.80	0.94	-0.34	NM	NM	NM	NM	NM	NM
	10/7/10		24.58	23.70	0.88	-0.23	NM	NM	NM	NM	NM	NM
	10/28/10		24.75	23.69	1.06	-0.27	NM	NM	NM	NM	NM	NM
	11/9/10		24.75	23.72	1.03	-0.29	NM	NM	NM	NM	NM	NM
	11/12/10		24.76	23.85	0.91	-0.39	NM	NM	NM	NM	NM	NM
	11/23/10		24.70	23.68	1.02	-0.24	NM	NM	NM	NM	NM	NM
	12/16/10		24.85	24.10	0.75	-0.60	NM	NM	NM	NM	NM	NM
	12/30/10		23.16	22.30	0.86	1.18	NM	NM	NM	NM	NM	NM
	1/14/11		24.71	24.40	0.31	-0.79	NM	NM	NM	NM	NM	NM
	2/10/11		22.74	22.41	0.33	1.20	NM	NM	NM	NM	NM	NM
	3/9/11		24.38	24.35	0.03	-0.67	NM	NM	NM	NM	NM	NM
	3/14/11		24.20	-	-	-0.51	17.09	4.40	-30	0.66	NM	6.7
	4/21/11		24.09	24.00	0.09	-0.33	NM	NM	NM	NM	NM	NM
	5/16/11		23.81	23.76	0.05	-0.08	NM	NM	NM	NM	NM	NM
	5/19/11		23.82	23.75	0.07	-0.08	NM	NM	NM	NM	NM	NM
	6/16/11		24.04	23.87	0.17	-0.22	NM	NM	NM	NM	NM	NM
	7/21/11		24.21	24.02	0.19	-0.38	NM	NM	NM	NM	NM	NM
	8/17/11		24.15	24.11	0.04	-0.43	NM	NM	NM	NM	NM	NM
	9/22/11		23.05	22.99	0.06	0.69	NM	NM	NM	NM	NM	NM
	10/27/11		22.93	22.90	0.03	0.78	NM	NM	NM	NM	NM	NM
	11/28/11		23.42	23.39	0.03	0.29	NM	NM	NM	NM	NM	NM
	12/21/11		23.13	23.07	0.06	0.61	NM	NM	NM	NM	NM	NM
	1/26/12		23.35	23.31	0.04	0.37	NM	NM	NM	NM	NM	NM
	2/29/12		23.86	23.54	0.32	0.07	NM	NM	NM	NM	NM	NM
	3/16/12		23.94	23.64	0.30	-0.02	NM	NM	NM	NM	NM	NM
	4/6/12		24.22	23.92	0.30	-0.31	NM	NM	NM	NM	NM	NM
	5/15/12		24.10	24.08	0.02	-0.39	NM	NM	NM	NM	NM	NM
	6/14/12		24.29	24.25	0.04	-0.57	NM	NM	NM	NM	NM	NM
	6/18/12		24.24	24.20	0.04	-0.52	NM	NM	NM	NM	NM	NM
	7/16/12		24.60	24.40	0.20	-0.76	NM	10.79	-31.80	NM	NM	6.19
	8/8/12		24.60	24.40	0.20	-0.76	NM	12.01	85.30	NM	NM	6.18
	9/11/12		24.46	24.41	0.05	-0.73	NM	NM	NM	NM	NM	NM
	11/27/12		24.45	24.40	0.05	-0.72	NM	NM	NM	NM	NM	NM
	12/31/12		24.65	24.60	0.05	-0.92	NM	NM	NM	NM	NM	NM
	1/17/13		24.70	24.58	0.12	-0.92	NM	NM	NM	NM	NM	NM
	2/27/13		24.42	24.41	0.01	-0.72	NM	NM	NM	NM	NM	NM

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp ('C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-226	3/23/09	22.02	22.51	-	-	-0.49	NM	0.25	-70.9	NM	NM	NM
	4/1/09	NM	-	-	-	NM	NM	7.00	-20	NM	NM	NM
	4/15/09	NM	-	-	-	NM	NM	5.28	-26	NM	NM	NM
	4/22/09	NM	-	-	-	NM	NM	0.88	-56	NM	NM	NM
	5/7/09	22.20	-	-	-0.18	NM	0.32	-73	NM	2,883	6.5	
	5/21/09	NM	-	-	-	NM	NM	1.80	NM	NM	NM	NM
	6/4/09	NM	-	-	-	NM	NM	1.06	-14	NM	NM	NM
	6/23/09	21.85	-	-	0.17	NM	0.22	-99.3	0.670	282	6.63	
	7/8/09	21.80	-	-	0.22	NM	4.34	22	NM	NM	5.7	
	7/21/09	21.86	-	-	0.16	NM	2.13	-16	NM	NM	5.7	
	8/4/09	21.82	-	-	0.20	NM	4.12	-36.0	NM	NM	6.4	
	8/19/09	21.73	-	-	0.29	NM	0.48	-125	NM	NM	6.6	
	9/9/09	21.49	-	-	0.53	NM	3.63	120	NM	NM	5.7	
	9/16/09	21.43	-	-	0.59	16.43	0.25	-97.2	0.663	321	6.69	
	9/23/09	21.35	-	-	0.67	NM	2.25	-44	NM	NM	6.3	
	10/7/09	21.95	-	-	0.07	NM	2.47	-35	NM	NM	6.3	
	10/22/09	22.22	-	-	-0.20	NM	1.80	-58	NM	NM	6.4	
	11/18/09	22.11	-	-	-0.09	NM	1.27	-86	NM	NM	6.5	
	11/25/09	22.04	-	-	-0.02	NM	NM	NM	NM	NM	NM	
	12/2/09	22.14	-	-	-0.12	NM	1.78	-42	NM	NM	6.2	
	12/10/09	21.67	-	-	0.35	14.91	0.27	-117.9	0.75	573	6.76	
	12/16/09	22.12	-	-	-0.10	NM	2.37	21	NM	NM	6.2	
	12/30/09	21.96	-	-	0.06	NM	1.84	-20	NM	NM	6.3	
	1/14/10	21.90	-	-	0.12	NM	1.6	-18	NM	NM	6.1	
	1/28/10	21.84	-	-	0.18	NM	1.71	-47	NM	NM	6.3	
	3/4/10	21.77	-	-	0.25	NM	2.28	-59	NM	NM	6.5	
	3/17/10	22.63	-	-	-0.61	16.19	0.14	-112	0.76	432	6.8	
	3/25/10	21.51	-	-	0.51	NM	1.94	-74	NM	NM	6.5	
	4/15/10	21.35	-	-	0.67	NM	2.62	-82	NM	NM	6.6	
	4/29/10	21.51	-	-	0.51	NM	2.91	-83	NM	NM	6.9	
	5/20/10	21.60	-	-	0.42	NM	2.20	-115	NM	NM	7.1	
	6/1/10	22.04	18.45	*3.59	2.67	NM	NM	NM	284	NM		
	6/3/10	22.09	21.52	0.57	0.36	NM	NM	NM	NM	NM	NM	
	6/17/10	22.22	21.54	0.68	0.31	NM	NM	NM	NM	NM	NM	
	7/13/10	22.31	21.65	0.66	0.21	NM	NM	NM	NM	NM	NM	
	7/29/10	22.00	21.59	0.41	0.33	NM	NM	NM	NM	NM	NM	
	8/12/10	21.33	21.30	0.03	0.71	NM	NM	NM	NM	NM	NM	
	8/26/10	21.86	-	-	0.16	NM	16.88	-30	NM	NM	7.8	
	9/9/10	21.85	21.81	0.04	0.20	NM	NM	NM	NM	NM	NM	
	9/23/10	22.31	22.02	0.29	-0.07	NM	NM	NM	NM	NM	NM	
	10/7/10	22.05	21.95	0.10	0.04	NM	NM	NM	NM	NM	NM	
	10/28/10	22.25	21.96	0.29	-0.01	NM	NM	NM	NM	NM	NM	
	11/9/10	22.38	22.00	0.38	-0.08	NM	NM	NM	NM	NM	NM	
	11/12/10	22.78	21.97	0.81	-0.15	NM	NM	NM	NM	NM	NM	
	11/23/10	22.56	21.88	0.68	-0.03	NM	NM	NM	NM	NM	NM	
	12/16/10	22.92	22.11	0.81	-0.29	NM	NM	NM	NM	NM	NM	
	12/30/10	24.83	24.35	0.48	-2.45	NM	NM	NM	NM	NM	NM	
	1/14/11	23.16	22.41	0.75	-0.58	NM	NM	NM	NM	NM	NM	
	2/10/11	24.49	24.40	0.09	-2.40	NM	NM	NM	NM	NM	NM	
	3/9/11	22.68	22.41	0.27	-0.46	NM	NM	NM	NM	NM	NM	
	3/14/11	22.23	-	-	-0.21	15.96	6.15	84.1	0.567	NM	7.2	
	4/21/11	22.10	22.05	0.05	-0.04	NM	NM	NM	NM	NM	NM	
	5/16/11	21.80	-	-	0.22	15.57	4.74	-14.1	0.389	NM	6.72	
	5/19/11	21.85	-	-	0.17	NM	2.51	-37	NM	NM	6.3	
	6/16/11	21.95	-	-	0.07	NM	3.02	-34	NM	NM	6.3	
	7/21/11	23.84	-	-	-1.82	NM	2.26	32.1	NM	NM	6.0	
	8/17/11	22.19	-	-	-0.17	NM	2.88	9.0	NM	NM	6.2	
	9/22/11	21.08	-	-	0.94	NM	2.24	35.0	NM	NM	6.2	
	10/27/11	20.96	-	-	1.06	NM	NM	NM	NM	NM	NM	
	11/28/11	21.44	-	-	0.58	NM	2.57	83.00	NM	NM	6.99	
	12/21/11	21.23	-	-	0.79	17.31	9.77	73.7	0.25	NM	6.4	
	1/26/12	22.64	22.32	0.32	-0.38	NM	NM	NM	NM	NM	NM	
	2/29/12	21.99	21.60	0.39	0.32	NM	NM	NM	NM	NM	NM	
	3/16/12	22.11	21.70	0.41	0.22	NM	NM	NM	NM	NM	NM	
	4/6/12	22.25	21.97	0.28	-0.02	NM	NM	NM	NM	NM	NM	
	5/15/12	22.29	22.11	0.18	-0.14	NM	NM	NM	NM	NM	NM	
	6/14/12	22.29	22.28	0.01	-0.26	NM	NM	NM	NM	NM	NM	
	6/18/12	22.23	22.21	0.02	-0.20	NM	NM	NM	NM	NM	NM	
	7/16/12	22.50	22.00	0.50	-0.11	NM	6.60	142.10	NM	NM	5.72	
	8/8/12	23.00	22.55	0.45	-0.64	NM	1.76	-52.30	NM	NM	6.64	
	9/11/12	22.62	22.34	0.28	-0.39	NM	NM	NM	NM	NM	NM	
	11/27/12	22.49	22.41	0.08	-0.41	NM	NM	NM	NM	NM	NM	
	12/31/12	22.65	22.60	0.05	-0.59	NM	NM	NM	NM	NM	NM	
	1/17/13	22.61	22.13	0.48	-0.23	NM	NM	NM	NM	NM	NM	
	2/27/13	22.40	-	-	-0.38	NM	3.38	6.00	NM	NM	NM	

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-230	9/14/07	20.19	-	-	-	-	19.5	0.87	-113.00	NM	770	7.0
	3/25/09		20.63	-	-	-0.44	NM	0.26	-105.9	NM	NM	NM
	4/1/09		NM	-	-	NM	NM	1.58	-84	NM	NM	NM
	4/15/09		NM	-	-	NM	NM	1.52	-69	NM	NM	NM
	4/22/09		NM	-	-	NM	NM	1.78	-58	NM	NM	NM
	5/7/09		18.70	-	-	1.49	NM	1.04	-79	NM	NM	NM
	5/21/09		NM	-	-	NM	NM	1.21	NM	NM	NM	NM
	6/4/09		NM	-	-	NM	NM	0.68	-71	NM	NM	NM
	6/23/09		18.65	-	-	1.54	NM	0.64	-105	NM	NM	NM
	7/8/09		19.62	-	-	0.57	NM	0.56	-126	NM	NM	6.4
	7/21/09		19.78	-	-	0.41	NM	0.78	-51	NM	NM	5.9
	8/4/09		19.29	-	-	0.90	NM	0.98	-111	NM	NM	6.7
	8/19/09		19.65	-	-	0.54	NM	0.33	-142	NM	NM	6.9
	9/9/09		19.32	-	-	0.87	NM	0.59	-125	NM	NM	6.7
	9/16/09		18.81	-	-	1.38	NM	NM	NM	NM	NM	NM
	9/23/09		19.09	-	-	1.10	NM	0.70	-106	NM	NM	6.7
	10/7/09		20.36	-	-	-0.17	NM	0.92	-96	NM	NM	6.6
	10/22/09		20.39	-	-	-0.20	NM	1.30	-97	NM	NM	6.7
	11/25/09		19.29	-	-	0.90	NM	NM	NM	NM	NM	NM
	12/2/09		20.92	-	-	-0.73	NM	2.07	-57	NM	NM	6.7
	12/10/09		20.91	-	-	-0.72	NM	NM	NM	319	NM	
	12/16/09		19.31	-	-	0.88	NM	5.00	0.6	NM	NM	7.0
	12/30/09		18.89	-	-	1.30	NM	1.51	-32	NM	NM	6.9
	1/14/10		20.27	-	-	-0.08	NM	2.62	-20	NM	NM	6.5
	1/28/10		18.95	-	-	1.24	NM	3.55	-5	NM	NM	7.3
	3/4/10		18.33	-	-	1.86	NM	3.03	-94	NM	NM	7.3
	3/17/10		16.57	-	-	3.62	NM	NM	NM	NM	NM	NM
	3/25/10		17.75	-	-	2.44	NM	3.74	16	NM	NM	6.9
	4/15/10		19.02	-	-	1.17	NM	3.06	-99	NM	NM	7.1
	4/29/10		17.97	-	-	2.22	NM	3.78	-66	NM	NM	7.2
	5/20/10		17.97	-	-	2.22	NM	3.37	-67	NM	NM	7.7
	6/1/10		20.07	-	-	0.12	NM	NM	NM	296	NM	
	6/3/10		20.33	-	-	-0.14	NM	4.33	29	NM	NM	6.8
	6/17/10		19.69	-	-	0.50	NM	3.36	-38	NM	NM	7.3
	7/13/10		†0.00	-	-	20.19	NM	5.45	27	NM	NM	6.8
	7/29/10		18.95	-	-	1.24	NM	2.35	-80	NM	NM	9.0
	8/12/10		20.20	-	-	-0.01	NM	2.37	-44	NM	NM	7.2
	8/26/10		22.59	-	-	-2.40	NM	3.04	-46	NM	NM	8.0
	9/9/10		22.61	-	-	-2.42	NM	9.40	24	NM	NM	8.9
	9/23/10		22.88	-	-	-2.69	NM	2.39	-50	NM	NM	7.2
	10/7/10		19.14	-	-	1.05	NM	4.05	3	NM	NM	6.7
	10/28/10		20.09	-	-	0.10	NM	3.58	-2	NM	NM	7.3
	11/9/10		19.60	-	-	0.59	NM	NM	NM	NM	NM	NM
	11/12/10		20.61	-	-	-0.42	NM	3.52	26	NM	NM	6.9
	11/23/10		20.30	-	-	-0.11	NM	3.65	-63	NM	NM	7.2
	12/16/10		19.86	-	-	0.33	NM	4.47	11	NM	NM	6.6
	12/30/10		20.76	-	-	-0.57	NM	4.78	35	NM	NM	7.3
	1/14/11		20.92	-	-	-0.73	NM	3.67	35	NM	NM	6.7
	2/10/11		17.66	-	-	2.53	NM	6.13	6	NM	NM	6.9
	3/9/11		17.69	-	-	2.50	NM	4.39	-31	NM	NM	7.2
	3/14/11		17.55	-	-	2.64	16.08	1.33	-26	0.807	NM	6.6
	4/21/11		17.60	-	-	2.59	NM	4.94	-3.8	NM	NM	8.2
	5/16/11		19.33	-	-	0.86	15.34	3.87	-20.7	0.422	NM	6.9
	5/19/11		17.15	-	-	3.04	NM	4.18	60.0	NM	NM	5.6
	6/16/11		19.95	-	-	0.24	NM	3.47	-8.0	NM	NM	6.4
	7/21/11		20.38	-	-	-0.19	NM	1.88	5.2	NM	NM	5.8
	8/17/11		17.97	-	-	2.22	NM	1.19	-5	NM	NM	6.7
	9/22/11		18.63	-	-	1.56	NM	1.31	23	NM	NM	6.3
	10/27/11		18.18	-	-	2.01	NM	NM	NM	NM	NM	NM
	11/28/11		18.25	-	-	1.94	NM	1.33	74.00	NM	NM	6.8
	12/21/11		18.67	-	-	1.52	18.23	4.04	30.6	0.23	NM	7.5
	1/26/12		17.40	-	-	2.79	NM	1.63	-110.1	NM	NM	6.9
	2/29/12		19.49	-	-	0.70	NM	6.63	63.0	NM	NM	6.5
	3/16/12		20.16	-	-	0.03	NM	5.66	-8.9	NM	NM	7.1
	4/6/12		20.48	-	-	-0.29	NM	6.75	19.5	NM	NM	7.4
	5/15/12		21.02	-	-	-0.83	NM	6.08	-42.0	NM	NM	7.05
	6/14/12		19.69	-	-	0.50	NM	0.98	-44.9	NM	NM	6.64
	6/18/12		20.27	-	-	-0.08	20.05	1.99	-84.8	NM	NM	6.69
	7/16/12		20.80	-	-	-0.61	NM	15.18	51.3	NM	NM	6.90
	8/8/12		20.70	-	-	-0.51	NM	2.34	-51.40	NM	NM	7.07
	9/11/12		20.80	-	-	-0.61	NM	17.13	48.70	NM	NM	6.81
	11/27/12		19.70	-	-	0.49	NM	8.57	-21.60	NM	NM	6.91
	12/31/12		20.35	-	-	-0.16	NM	10.97	31.80	NM	NM	7.04
	1/17/13		20.34	-	-	-0.15	NM	2.25	12.20	NM	NM	6.76
	2/27/13		20.34	-	-	-0.15	NM	7.84	81.00	NM	NM	NM

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conduc-tivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-231	9/14/07	19.94	-	-	-	-	20.30	0.65	-90.00	NM	2,958	6.8
	3/25/09		20.84	-	-	-0.90	NM	0.30	-106.5	NM	NM	NM
	4/1/09		NM	-	-	NM	NM	1.22	-82	NM	NM	NM
	4/15/09		NM	-	-	NM	NM	1.40	-41	NM	NM	NM
	4/22/09		NM	-	-	NM	NM	3.45	2.0	NM	NM	NM
	5/7/09		19.89	-	-	0.05	NM	0.32	-23	NM	4,935	3.1
	5/21/09		NM	-	-	NM	NM	2.12	NM	NM	NM	NM
	6/4/09		NM	-	-	NM	NM	1.01	-75	NM	NM	NM
	6/22/09		19.22	-	-	0.72	NM	0.35	-99.5	1,410	301	6.51
	7/8/09		20.04	-	-	-0.10	NM	0.51	-104	NM	NM	6.2
	7/21/09		20.19	-	-	-0.25	NM	0.75	-72	NM	NM	5.9
	8/4/09		20.15	-	-	-0.21	NM	1.08	-82	NM	NM	6.4
	8/19/09		20.02	-	-	-0.08	NM	0.91	-100	NM	NM	6.5
	9/9/09		19.76	-	-	0.18	NM	1.20	-78	NM	NM	6.4
	9/16/09		19.66	-	-	0.28	19.70	0.42	-94.9	0.870	3,636	6.53
	9/23/09		19.62	-	-	0.32	NM	0.84	-39	NM	NM	6.2
	10/7/09		20.12	-	-	-0.18	NM	1.40	-58	NM	NM	6.2
	10/22/09		20.47	-	-	-0.53	NM	0.66	-41	NM	NM	6.1
	11/25/09		20.28	-	-	-0.34	NM	NM	NM	NM	NM	NM
	12/2/09		20.40	-	-	-0.46	NM	1.11	-82	NM	NM	6.4
	12/10/09		20.04	-	-	-0.10	17.16	0.83	-100.3	1,289	2,181	6.46
	12/16/09		20.55	-	-	-0.61	NM	2.66	-33	NM	NM	6.2
	12/30/09		20.18	-	-	-0.24	NM	1.10	-69	NM	NM	6.4
	1/14/10		20.11	-	-	-0.17	NM	1.81	-68	NM	NM	6.1
	1/28/10		20.04	-	-	-0.10	NM	1.71	-69	NM	NM	6.4
	3/4/10		20.02	-	-	-0.08	NM	2.01	-66	NM	NM	6.5
	3/17/10		19.84	-	-	0.10	20.31	0.10	-140	1,689	660	6.7
	3/25/10		19.85	-	-	0.09	NM	2.24	-72	NM	NM	6.7
	4/15/10		19.60	-	-	0.34	NM	1.20	-72	NM	NM	6.3
	4/29/10		19.76	-	-	0.18	NM	1.68	-36	NM	NM	6.5
	5/20/10		19.91	-	-	0.03	NM	1.63	-67	NM	NM	6.6
	6/1/10		19.93	-	-	0.01	21.73	0.18	-111.4	1,616	427	6.7
	6/3/10		19.94	-	-	0.00	NM	1.81	-20	NM	NM	6.4
	6/17/10		20.04	-	-	-0.10	NM	1.97	-30	NM	NM	6.4
	7/13/10		19.87	-	-	0.07	NM	0.98	-68	NM	NM	6.1
	7/29/10		19.81	-	-	0.13	NM	3.27	28	NM	NM	6.9
	8/12/10		19.95	-	-	-0.01	NM	1.71	-29	NM	NM	6.9
	8/26/10		20.17	-	-	-0.23	NM	2.54	-18	NM	NM	7.1
	9/9/10		20.17	-	-	-0.23	NM	3.50	-36	NM	NM	7.6
	9/23/10		20.46	-	-	-0.52	NM	4.93	15	NM	NM	7.4
	10/7/10		20.33	-	-	-0.39	NM	2.87	4	NM	NM	6.6
	10/28/10		20.38	-	-	-0.44	NM	3.07	2	NM	NM	6.5
	11/9/10		20.42	-	-	-0.48	NM	NM	NM	NM	NM	NM
	11/12/10		20.55	-	-	-0.61	NM	4.15	46	NM	NM	6.1
	11/23/10		20.38	-	-	-0.44	NM	2.39	-50	NM	NM	7.2
	12/16/10		21.08	21.07	0.01	-1.13	NM	NM	NM	NM	NM	NM
	12/30/10		20.81	20.80	0.01	-0.86	NM	NM	NM	NM	NM	NM
	1/14/11		21.11	20.82	0.29	-0.95	NM	NM	NM	NM	NM	NM
	2/10/11		20.79	20.24	0.55	-0.44	NM	NM	NM	NM	NM	NM
	3/9/11		20.73	20.25	0.48	-0.43	NM	NM	NM	NM	NM	NM
	3/14/11		20.13	-	-	-0.19	18.01	1.89	-27	2,56	NM	6.5
	4/21/11		20.46	20.01	0.45	-0.18	NM	NM	NM	NM	NM	NM
	5/16/11		19.98	19.92	0.06	0.00	NM	NM	NM	NM	NM	NM
	5/19/11		20.40	20.02	0.38	-0.17	NM	NM	NM	NM	NM	NM
	6/16/11		20.49	20.12	0.37	-0.27	NM	NM	NM	NM	NM	NM
	7/21/11		20.61	20.29	0.32	-0.43	NM	NM	NM	NM	NM	NM
	8/17/11		20.65	20.44	0.21	-0.55	NM	NM	NM	NM	NM	NM
	9/22/11		19.36	19.21	0.15	0.69	NM	NM	NM	NM	NM	NM
	10/27/11		-	-	-	-	NM	NM	NM	NM	NM	NM
	11/28/11		19.91	19.73	0.18	0.17	NM	NM	NM	NM	NM	NM
	12/21/11		19.60	19.46	0.14	0.45	NM	NM	NM	NM	NM	NM
	1/26/12		19.66	19.52	0.14	0.39	NM	NM	NM	NM	NM	NM
	2/29/12		20.01	19.89	0.12	0.02	NM	NM	NM	NM	NM	NM
	3/16/12		19.83	19.76	0.07	0.16	NM	NM	NM	NM	NM	NM
	6/18/12		20.60	20.49	0.11	-0.58	NS	NS	NS	NS	NS	NS
	7/16/12		21.40	20.70	0.70	-0.93	NM	26.00	-70.3	NM	NM	6.61
	8/8/12		21.20	20.90	0.30	-1.04	NM	NM	NM	NM	NM	NM
	9/11/12		21.20	20.50	0.70	-0.73	NM	NM	NM	NM	NM	NM
	11/27/12		20.74	20.66	0.08	-0.74	NM	NM	NM	NM	NM	NM
	12/31/12		20.90	20.88	0.02	-0.94	NM	NM	NM	NM	NM	NM
	1/17/13		21.42	21.18	0.24	-1.30	NM	NM	NM	NM	NM	NM
	2/27/13		20.56	-	-	-0.62	NM	3.52	26.00	NM	NM	NM

TABLE 2
Field Measurements
26th Street South Area (AOI-1)
Sunoco, Inc. Philadelphia Refinery



Well ID	Sample Date	Casing Elev (feet)	DTW	DTP	Prod. Thickness	GW Elev	Temp (°C)	DO (mg/L)	ORP (mV)	Conductivity (mS/cm)	CO2 (ppm) (@10 sec.)	pH
S-232	9/14/07	20.31	-	-	-	NM	NM	NM	-110.1	NM	NM	NM
	3/25/09		21.55	-	-	-1.24	NM	0.20		NM	NM	NM
	4/1/09		NM	-	-	NM	NM	27.30	23	NM	NM	NM
	4/15/09		NM	-	-	NM	NM	26.11	28	NM	NM	NM
	4/22/09		NM	-	-	NM	NM	13.85	147	NM	NM	NM
	5/7/09		20.69	-	-	-0.38	NM	11.09	284	NM	563	3.0
	5/21/09		NM	-	-	NM	NM	9.12	NM	NM	NM	NM
	6/4/09		NM	-	-	NM	NM	19.90	43	NM	NM	NM
	6/22/09		20.46	-	-	-0.15	NM	6.25	31.5	1.781	271	6.38
	7/8/09		21.01	-	-	-0.70	NM	31.02	3	NM	NM	6.8
	7/21/09		21.02	-	-	-0.71	NM	30.97	0.2	NM	NM	6.4
	8/4/09		20.80	-	-	-0.49	NM	22.51	-15	NM	NM	6.5
	8/19/09		20.89	-	-	-0.58	NM	21.02	29	NM	NM	6.6
	9/9/09		20.34	-	-	-0.03	NM	12.15	-12	NM	NM	6.5
	9/16/09		19.55	-	-	0.76	19.41	0.61	1.3	1.710	723	6.55
	9/23/09		20.23	-	-	0.08	NM	17.10	0.0	NM	NM	6.6
	10/7/09		20.59	-	-	-0.28	NM	22.80	-20.0	NM	NM	6.6
	10/22/09		20.58	-	-	-0.27	NM	13.96	-24.0	NM	NM	6.5
	11/25/09		20.67	-	-	-0.36	NM	NM	NM	NM	NM	NM
	12/2/09		20.99	-	-	-0.68	NM	28.17	-41	NM	NM	6.9
	12/10/09		20.07	-	-	0.24	18.35	26.58	56.70	1.667	369	6.80
	12/16/09		20.87	-	-	-0.56	NM	29.42	5	NM	NM	6.8
	12/30/09		20.72	-	-	-0.41	NM	23.33	-35	NM	NM	6.7
	1/14/10		24.84	-	-	-4.53	NM	22.85	95	NM	NM	6.4
	1/28/10		20.61	-	-	-0.30	NM	29.63	14	NM	NM	6.9
	3/4/10		20.60	-	-	-0.29	NM	22.91	9	NM	NM	6.8
	3/17/10		20.22	-	-	0.09	20.54	1.65	34	1.92	2,397	6.6
	3/25/10		20.25	-	-	0.06	NM	2.49	22	NM	NM	6.7
	4/15/10		20.11	-	-	0.20	NM	2.81	-4	NM	NM	6.7
	4/29/10		20.25	-	-	0.06	NM	1.84	-29	NM	NM	6.7
	5/20/10		20.48	-	-	-0.17	NM	2.84	-20	NM	NM	6.9
	6/1/10		19.44	-	-	0.87	22.22	0.66	-37.8	2.116	368	6.8
	6/3/10		20.51	-	-	-0.20	NM	3.05	-22	NM	NM	6.6
	6/17/10		20.71	-	-	-0.40	NM	10.29	30	NM	NM	6.8
	7/13/10		19.40	-	-	0.91	NM	1.31	-86	NM	NM	6.5
	7/29/10		19.45	-	-	0.86	NM	4.01	23	NM	NM	6.9
	8/12/10		19.65	-	-	0.66	NM	1.99	-38	NM	NM	7.5
	8/26/10		19.82	-	-	0.49	NM	2.18	20	NM	NM	6.9
	9/9/10		20.18	-	-	0.13	NM	6.35	-23	NM	NM	7.7
	9/23/10		21.10	-	-	-0.79	NM	2.97	35	NM	NM	6.7
	10/7/10		20.97	-	-	-0.66	NM	2.35	35	NM	NM	6.3
	10/28/10		21.00	-	-	-0.69	NM	18.36	16	NM	NM	6.5
	11/9/10		21.18	-	-	-0.87	NM	NM	NM	NM	NM	NM
	11/12/10		21.31	-	-	-1.00	NM	12.22	36	NM	NM	6.3
	11/23/10		21.04	-	-	-0.73	NM	9.05	-17	NM	NM	6.5
	12/16/10		21.47	-	-	-1.16	NM	5.46	61	NM	NM	6.3
	12/30/10		21.60	-	-	-1.29	NM	3.97	69	NM	NM	6.7
	1/14/11		21.65	-	-	-1.34	NM	3.24	7	NM	NM	6.5
	2/10/11		21.18	-	-	-0.87	NM	4.56	35	NM	NM	6.7
	3/9/11		21.01	-	-	-0.70	NM	3.64	15	NM	NM	6.6
	3/14/11		20.75	-	-	-0.44	19.11	1.39	-43	1.07	NM	6.8
	4/21/11		20.64	-	-	-0.33	NM	5.83	13	NM	NM	6.9
	5/16/11		20.89	-	-	-0.58	19.03	3.32	-5	0.53	NM	6.7
	5/19/11		20.94	-	-	-0.63	NM	2.28	-20	NM	NM	6.4
	6/16/11		21.04	-	-	-0.73	NM	2.09	-20	NM	NM	6.7
	7/21/11		21.17	-	-	-0.86	NM	1.65	4.9	NM	NM	5.8
	8/17/11		21.27	-	-	-0.96	NM	1.34	45	NM	NM	5.3
	9/22/11		20.12	-	-	0.19	NM	0.94	26.0	NM	NM	5.9
	10/27/11		-	-	-	-	NM	NM	NM	NM	NM	NM
	11/28/11		20.28	-	-	1.74	NM	2.79	64.00	NM	NM	6.29
	12/21/11		19.79	-	-	2.23	20.57	4.15	8.1	0.37	NM	7.7
	1/26/12		20.00	-	-	2.02	NM	1.58	-163.4	0.37	NM	6.7
	2/29/12		19.61	19.58	0.03	0.72	NM	NM	NM	NM	NM	NM
	3/16/12		20.16	-	-	0.15	NM	3.77	-3.9	NM	NM	7.0
	4/6/12		20.91	-	-	-0.60	NM	3.14	12.8	NM	NM	7.30
	5/15/12		20.03	-	-	0.28	NM	6.42	-49.8	NM	NM	7.25
	6/14/12		21.31	-	-	-1.00	NM	0.81	-18.3	NM	NM	6.64
	6/18/12		21.34	-	-	-1.03	21.31	1.76	-90.8	NM	NM	6.8
	7/16/12		21.70	21.60	0.10	-1.32	NM	1.17	-102.1	NM	NM	6.53
	8/8/12		21.50	-	-	-1.19	NM	1.54	-58.3	NM	NM	6.47
	9/11/12		22.10	-	-	-1.79	NM	1.28	-101.3	NM	NM	7.01
	11/27/12		20.82	-	-	-0.51	NM	7.08	6.7	NM	NM	6.61
	12/31/12		21.09	-	-	-0.78	NM	11.10	9.5	NM	NM	6.84
	1/17/13		21.44	-	-	-1.13	NM	0.98	12.4	NM	NM	6.66
	2/27/13		20.41	-	-	-0.10	NM	5.16	31.0	NM	NM	NM

DTW = depth to water (measured from top of inner casing); DTP = depth to product if present (measured from top of inner casing)
Total Depth = Depth to bottom of well (measured from top of inner casing)

Some measurements collected on a monthly basis as part of performance monitoring and some on a quarterly basis as part of quarterly sampling program.

Note: If Readings from O&M and GW sampling occurred on same day (or within a day), the GW Sampling reading was tabulated.

Note that DO during GW sampling is consistently lower than 'grab' samples done during O&M.

System shut down on 11-13-09 due to paving activities; restarted on 11-18-09. (switched injection to shallow points except deep injection at IP-17, 18 & 19. Could not read 17th Street points on 11/25/09 due to continued paving in roadway. During February visits could not check wells due to amount of snow.

† - depth to water was 0.0 (at surface) most likely due to surface run off entering well.

*Measurement assumed to be erroneously high - well regauged two days later and confirmed with bailer to be closer to second reading.

TABLE 3a

SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM DO FIELD DATA
SHALLOW WELLS ONLY



DATE	IW-1S	IW-2S	IW-3S	IW-4S	IW-5S	IW-6S	IW-7S	IW-8S	IW-9S	IW-10S	IW-11S	IW-12S	IW-13S	IW-14S	IW-15S	IW-16S	IW-17S	IW-18S	IW-19S	IW-20S	IW-21S	IW-22S	IW-23S	IW-24S	IW-25S	IW-26S	IW-27S	
25-Mar-09	4.36	3.89	3.16	2.79	1.86	1.82	1.31	1.79	1.87	1.92	1.14	1.47	1.79	1.05	0.22	1.33	0.25	0.23	0.22	2.13	0.16	0.18	0.26	0.43	1.53	0.22	0.29	
8-Apr-09	7.20	16.01	3.83	14.01	3.13	13.06	5.27	7.28	20.70	22.72	9.54	25.11	3.36	29.35	4.05	29.26	21.86	38.92	26.06	34.60	5.20	23.00	12.31	3.31	22.87	28.10	2.74	
15-Apr-09	4.92	27.80	NM-I	25.37	4.98	25.11	4.09	22.85	33.58	5.38	3.31	32.20	3.50	33.33	3.36	NM	NM											
22-Apr-09	NM	NM	NM	NM	NM	30.51	33.04	30.53	33.55	22.48	25.58	47.03	53.05	4.02	49.87	32.17	3.85											
06-May-09	35.15	NM	3.21	NM	3.05	NM	2.15	NM	39.31	NM	13.28	NM	5.30	NM	3.23	NM	36.66	NM	37.73	NM	10.44	NM	37.92	NM	39.58	NM	3.97	
21-May-09	NM	5.72	NM	28.50	NM	35.16	NM	36.28	NM	16.52	NM	36.96	NM	39.07	NM	37.80	NM	36.44	NM	37.20	NM	38.44	NM	4.55	NM	36.11	NM	
04-Jun-09	31.45	NM	3.10	NM	2.28	NM	2.17	NM	37.82	NM	1.82	NM	15.82	NM	2.45	NM	26.71	NM	33.80	NM	15.64	NM	27.38	NM	27.27	NM	2.61	
23-Jun-09	NM	17.66	NM	19.85	NM	15.39	NM	17.36	NM	7.01	NM	24.88	NM	26.16	NM	26.26	NM	26.85	NM	15.84	NM	29.20	NM	2.66	NM	20.35	NM	
08-Jul-09	34.40	NM	2.29	NM	2.68	NM	3.56	NM	32.86	NM	3.19	NM	36.09	NM	2.78	NM	33.70	NM	32.20	NM	18.92	NM	36.01	NM	34.93	NM	32.52	
21-Jul-09	NM	17.40	NM	34.70	NM	34.84	NM	30.71	NM	17.53	NM	36.34	NM	33.27	NM	31.70	NM	31.08	NM	31.78	NM	35.03	NM	3.30	NM	31.88	NM	
04-Aug-09	6.00	NM	35.25	NM	2.65	NM	3.98	NM	34.53	NM	2.55	NM	34.88	NM	2.19	NM	30.75	NM	30.18	NM	3.79	NM	34.71	NM	32.41	NM	31.32	
19-Aug-09	NM	15.09	NM	37.85	NM	42.38	NM	25.54	NM	19.52	NM	14.10	NM	10.79	NM	19.51	NM	18.37	NM	31.71	NM	32.96	NM	14.95	NM	36.20	NM	
09-Sep-09	35.96	NM	2.91	NM	3.29	NM	6.62	NM	33.46	NM	2.75	NM	34.35	NM	4.70	NM	25.81	NM	28.01	NM	25.20	NM	34.04	NM	15.45	NM	27.52	
23-Sep-09	NM	19.22	NM	33.26	NM	34.42	NM	32.01	NM	20.61	NM	35.33	NM	33.13	NM	35.51	NM	31.82	NM	34.40	NM	29.11	NM	NM	NM	36.01	NM	
7-Oct-09	36.22	NM	2.45	NM	3.99	NM	9.16	NM	30.88	NM	2.88	NM	32.76	NM	2.74	NM	31.10	NM	27.40	NM	28.48	NM	29.63	NM	38.48	NM	36.66	
21-Oct-09	NM	25.01	NM	35.52	NM	32.69	NM	31.98	NM	22.04	NM	30.39	NM	32.23	NM	31.87	NM	30.65	NM	28.18	NM	33.27	NM	4.11	NM	34.18	NM	
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	26.08	27.40	25.77	24.55	30.33	30.04											
2-Dec-09	29.94	NM	35.28	NM	34.80	NM	26.95	NM	33.11	NM	17.10	NM	25.85	NM	31.51	NM	33.16	NM	31.08	NM	25.86	NM	30.80	NM	19.71	NM	17.56	
16-Dec-09	NM	35.58	NM	20.27	NM	27.61	NM	23.17	NM	29.90	NM	6.36	NM	34.37	NM	33.99	NM	36.55	NM	32.80	NM	29.80	NM	30.90	NM	31.49	NM	
30-Dec-09	36.39	NM	36.95	NM	35.10	NM	28.08	NM	28.21	NM	7.43	NM	26.76	NM	29.37	NM	30.42	NM	33.96	NM	27.63	NM	34.00	NM	10.13	NM	35.23	
14-Jan-10	NM	30.84	NM	33.33	NM	25.93	NM	22.00	NM	28.87	NM	24.38	NM	27.80	NM	25.96	NM	28.52	NM	26.19	NM	22.70	NM	22.94	NM	18.27	NM	
28-Jan-10	36.39	NM	36.14	NM	31.92	NM	24.88	NM	28.86	NM	3.85	NM	25.56	NM	30.07	NM	32.33	NM	30.57	NM	24.21	NM	33.58	NM	32.97	NM	32.73	
4-Mar-10	36.87	NM	42.25	NM	39.58	NM	20.84	NM	31.50	NM	5.46	NM	26.06	NM	30.77	NM	33.16	NM	32.19	NM	19.38	NM	33.53	NM	37.81	NM	34.69	
25-Mar-10	NM	29.48	NM	25.73	NM	28.75	NM	25.08	NM	32.64	NM	7.05	NM	32.62	NM	31.78	NM	33.23	NM	31.38	NM	21.14	NM	27.63	NM	33.64	NM	
15-Apr-10	34.83	NM	35.04	NM	36.13	NM	18.88	NM	28.83	NM	5.18	NM	25.65	NM	29.42	NM	32.08	NM	29.33	NM	22.57	NM	34.50	NM	32.86	NM	30.30	
29-Apr-10	NM	31.49	NM	31.25	NM	37.24	NM	28.91	NM	35.93	NM	5.14	NM	33.98	NM	30.06	NM	32.64	NM	29.36	NM	29.08	NM	29.91	NM	33.95	NM	
20-May-10	30.70	NM	34.42	NM	35.40	NM	14.41	NM	27.67	NM	5.85	NM	24.98	NM	24.56	NM	34.76	NM	32.28	NM	26.19	NM	30.64	NM	34.11	NM	28.66	
3-Jun-10	NM	30.24	NM	32.34	NM	35.26	NM	27.27	NM	32.38	NM	4.24	NM	8.91	NM	26.94	NM	32.44	NM	27.60	NM	23.73	NM	28.09	NM	32.71	NM	
17-Jun-10	32.86	NM	34.43	NM	34.96	NM	39.16	NM	28.41	NM	6.73	NM	21.67	NM	29.58	NM	33.56	NM	29.69	NM	28.41	NM	29.78	NM	34.66	NM	28.44	
13-Jul-10	NM	28.11	NM	19.43	NM	3.96	NM	8.25	NM																			

TABLE 3b

 SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
 SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM DO FIELD DATA
DEEP WELLS ONLY

DATE	IW-1D	IW-2D	IW-3D	IW-4D	IW-5D	IW-6D	IW-7D	IW-8D	IW-9D	IW-10D	IW-11D	IW-12D	IW-13D	IW-14D	IW-15D	IW-16D	IW-17D	IW-18D	IW-19D	IW-20D	IW-21D	IW-22D	IW-23D	IW-24D	IW-25D	IW-26D	IW-27D
25-Mar-09	7.04	2.13	2.28	2.77	1.93	2.07	0.38	1.89	1.45	2.01	1.66	1.6	1.68	2.31	0.25	1.44	0.99	0.22	1.43	1.94	1.51	0.2	0.25	1.72	NM	0.2	1.37
08-Apr-09	12.56	13.02	14.23	2.77	13.94	13.65	15.48	26.26	18.66	31.27	29.02	18.20	12.48	18.94	35.51	30.10	14.98	19.89	19.90	15.50	20.20	6.88	22.91	16.08	30.94	10.57	14.87
15-Apr-09	15.52	30.24	NM-I	2.79	35.98	33.70	33.62	30.46	32.95	37.01	32.73	32.65	13.01	34.17	36.50	NM											
22-Apr-09	NM	NM	NM	NM	NM	NM	30.70	13.76	15.55	28.10	19.52	41.07	12.10	54.80	48.13	47.11	13.65	49.40									
06-May-09	12.73	NM	27.80	NM	37.48	NM	33.88	NM	37.94	NM	41.28	NM	17.77	NM	38.12	NM	21.37	NM	34.62	NM	31.42	NM	34.88	NM	42.54	NM	34.15
21-May-09	NM	39.77	NM	3.23	NM	40.11	NM	37.81	NM	39.50	NM	36.11	NM	34.80	NM	27.56	NM	27.47	NM	26.32	NM	26.77	NM	39.30	NM	13.33	NM
04-Jun-09	5.40	NM	33.77	NM	32.94	NM	31.78	NM	31.01	NM	37.32	NM	28.55	NM	29.82	NM	16.85	NM	29.60	NM	28.65	NM	26.73	NM	30.75	NM	26.23
23-Jun-09	NM	25.50	NM	2.84	NM	21.25	NM	25.66	NM	26.51	NM	21.54	NM	19.74	NM	29.71	NM	13.85	NM	11.86	NM	16.91	NM	22.56	NM	16.25	NM
08-Jul-09	12.74	NM	39.12	NM	33.94	NM	36.58	NM	34.91	NM	41.18	NM	34.88	NM	37.54	NM	32.78	NM	34.12	NM	30.98	NM	32.68	NM	39.62	NM	34.55
21-Jul-09	NM	37.54	NM	4.29	NM	40.77	NM	36.37	NM	42.90	NM	37.60	NM	35.80	NM	38.77	NM	27.27	NM	31.50	NM	33.10	NM	36.91	NM	32.55	NM
04-Aug-09	34.08	NM	1.64	NM	39.06	NM	34.53	NM	37.98	NM	41.07	NM	31.55	NM	33.21	NM	24.30	NM	36.36	NM	33.34	NM	30.80	NM	42.22	NM	37.15
19-Aug-09	NM	40.53	NM	2.50	NM	42.12	NM	40.80	NM	44.36	NM	17.30	NM	6.49	NM	10.20	NM	19.24	NM	41.83	NM	26.00	NM	46.01	NM	18.29	NM
09-Sep-09	5.30	NM	38.38	NM	33.68	NM	35.64	NM	33.32	NM	35.77	NM	31.87	NM	35.35	NM	29.70	NM	31.75	NM	33.11	NM	33.26	NM	38.00	NM	33.80
23-Sep-09	NM	37.40	NM	2.90	NM	33.92	NM	34.57	NM	35.58	NM	34.34	NM	33.50	NM	33.96	NM	31.67	NM	27.31	NM	26.61	NM	38.13	NM	23.25	NM
7-Oct-09	5.25	NM	38.12	NM	39.72	NM	36.71	NM	36.82	NM	34.62	NM	33.44	NM	35.01	NM	30.03	NM	33.61	NM	30.66	NM	28.75	NM	38.06	NM	36.42
21-Oct-09	NM	36.16	NM	2.96	NM	35.50	NM	35.63	NM	35.89	NM	36.17	NM	35.23	NM	32.60	NM	30.18	NM	30.66	NM	17.38	NM	37.22	NM	18.17	NM
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	15.71	27.72	33.91	35.67	16.02	31.73										
2-Dec-09	29.75	NM	29.51	NM	25.88	NM	37.00	NM	29.18	NM	30.96	NM	27.51	NM	31.03	NM	31.11	NM	32.72	NM	24.02	NM	24.01	NM	33.56	NM	30.58
16-Dec-09	NM	21.56	NM	41.41	NM	22.92	NM	24.44	NM	37.15	NM	19.29	NM	21.75	NM	16.73	NM	36.29	NM	19.50	NM	7.00	NM	31.72	NM	7.85	NM
30-Dec-09	16.78	NM	26.99	NM	22.91	NM	36.31	NM	23.07	NM	26.77	NM	22.11	NM	28.73	NM	33.70	NM	36.53	NM	15.08	NM	20.71	NM	25.54	NM	28.33
14-Jan-10	NM	11.81	NM	24.54	NM	22.02	NM	16.77	NM	23.15	NM	9.80	NM	10.20	NM	5.84	NM	29.29	NM	10.17	NM	5.57	NM	24.46	NM	3.91	NM
28-Jan-10	12.31	NM	17.66	NM	18.66	NM	35.30	NM	20.81	NM	22.44	NM	17.63	NM	24.58	NM	30.62	NM	34.90	NM	7.77	NM	7.02	NM	38.37	NM	24.51
4-Mar-10	11.12	NM	12.69	NM	5.28	NM	36.15	NM	16.77	NM	17.95	NM	11.72	NM	22.46	NM	35.95	NM	36.74	NM	8.74	NM	5.64	NM	44.14	NM	18.40
25-Mar-10	NM	9.12	NM	21.28	NM	15.05	NM	18.55	NM	20.46	NM	6.70	NM	12.31	NM	4.21	NM	31.51	NM	9.06	NM	10.21	NM	21.45	NM	11.44	NM
15-Apr-10	12.66	NM	11.91	NM	7.73	NM	34.11	NM	13.66	NM	16.07	NM	8.84	NM	17.38	NM	28.24	NM	32.42	NM	5.52	NM	5.84	NM	38.12	NM	15.17
29-Apr-10	NM	5.86	NM	15.39	NM	14.48	NM	16.40	NM	19.59	NM	3.66	NM	8.44	NM	3.47	NM	31.69	NM	11.08	NM	5.70	NM	19.96	NM	9.36	NM
20-May-10	7.53	NM	8.88	NM	5.03	NM	34.40	NM	16.12	NM	12.58	NM	6.37	NM	13.55	NM	32.97	NM	29.75	NM	4.27	NM	7.03	NM	39.17	NM	10.69
3-Jun-10	NM	7.25	NM	10.32	NM	12.25	NM	15.34	NM	18.05	NM	3.97	NM	30.29	NM	3.25	NM	30.08	NM	8.05	NM	5.58	NM	15.31	NM	4.93	NM
17-Jun-10	7.77	NM	6.53	NM	6.28	NM	26.71	NM	14.02	NM	10.05	NM	3.52	NM	11.63	NM	30.33	NM	35.01	NM	3.70	NM	6.02	NM	38.61	NM	6.67
13-Jul-10	NM	NM	NM	NM	NM	NM	7.43	NM	11.15	NM	4.92	NM	32.57	NM													

TABLE 4a

 SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
 SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM ORP FIELD DATA
SHALLOW WELLS ONLY

DATE	IW-1S	IW-2S	IW-3S	IW-4S	IW-5S	IW-6S	IW-7S	IW-8S	IW-9S	IW-10S	IW-11S	IW-12S	IW-13S	IW-14S	IW-15S	IW-16S	IW-17S	IW-18S	IW-19S	IW-20S	IW-21S	IW-22S	IW-23S	IW-24S	IW-25S	IW-26S	IW-27S	
25-Mar-09	16	-183	-126	-262	-102	-11	-47	-71	-27	-74	-20	-193	-135	-127	-148	-169	-183	-180	-174	-182	-221	-150	-162	-239	-213	166	-121	
8-Apr-09	-88	-43	141	272	-4	309	205	104	316	206	81	325	1	292	116	297	287	299	294	368	125	257	219	32	240	269	78	
15-Apr-09	-5	-20	NM-I	64	-77	34	-24	51	69	24	-21	56	-1	64	3.36	NM	NM											
22-Apr-09	NM	NM	NM	NM	NM	NM	NM	47	57	45	87	83	112	24	51	-43	32	33	-50									
6-May-09	69	NM	157	NM	-68	NM	17	NM	286	NM	-14	NM	153	NM	-51	NM	270	NM	296	NM	319	NM	312	NM	316	NM	-2	
21-May-09	NM	5.72	NM	NM	NM	NM	NM	NM	37.8	NM																		
4-Jun-09	29	NM	-81	NM	-116	NM	-89	NM	110	NM	-88	NM	96	NM	-86	NM	55	NM	70	NM	23	NM	116	NM	153	NM	-4	
23-Jun-09	NM	-105	NM	123	NM	144	NM	145	NM	165	NM	165	NM	127	NM	36	NM	40	NM	70	NM	115	NM	-114	NM	40	NM	
8-Jul-09	-23	NM	-116	NM	-105	NM	-61	NM	48	NM	-94	NM	35	NM	-74	NM	26	NM	47	NM	30	NM	94	NM	84	NM	99	
22-Jul-09	NM	-120	NM	68	NM	90	NM	84	NM	105	NM	92	NM	21	NM	51	NM	64	NM	53	NM	-3	NM	-89	NM	-5	NM	
4-Aug-09	-150	NM	-41	NM	-114	NM	-101	NM	-17	NM	-100	NM	8	NM	-97	NM	13	NM	-5	NM	-22	NM	-4	NM	28	NM	52	
19-Aug-09	NM	-119	NM	13	NM	51	NM	51	NM	80	NM	54	NM	27	NM	53	NM	46	NM	52	NM	35	NM	-91	NM	9	NM	
9-Sep-09	13	NM	-105	NM	-100	NM	-65	NM	58	NM	-92	NM	27	NM	-79	NM	0	NM	18	NM	58	NM	42	NM	47	NM	75	
23-Sep-09	NM	-94	NM	30	NM	86	NM	113	NM	135	NM	129	NM	30	NM	49	NM	40	NM	8	NM	48	NM	-72	NM	14	NM	
7-Oct-09	-33	NM	-141	NM	-90	NM	-60	NM	23	NM	-75	NM	34	NM	-75	NM	-3	NM	20	NM	28	NM	30	NM	42	NM	78	
21-Oct-09	NM	-98	NM	-66	NM	36	NM	74	NM	103	NM	116	NM	4	NM	25	NM	46	NM	52	NM	3	NM	-70	NM	36	NM	
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	5	NM	52	75	-67	-5	61								
2-Dec-09	-6	NM	30	NM	8	NM	40	NM	69	NM	31	NM	52	NM	51	NM	68	NM	77	NM	79	NM	84	NM	92	NM	80	
16-Dec-09	NM	103	NM	108	NM	22	NM	-4	NM	42	NM	42	NM	401	NM	7	NM	11	NM	50	NM	0	NM	24	NM	68	NM	
30-Dec-09	-22	NM	23	NM	42	NM	62	NM	47	NM	-44	NM	46	NM	24	NM	37	NM	47	NM	45	NM	34	NM	46	NM	73	
14-Jan-10	NM	53	NM	107	NM	123	NM	58	NM	82	NM	117	NM	478	NM	139	NM	120	NM	146	NM	55	NM	72	NM	100	NM	
28-Jan-10	39	NM	76	NM	-49	NM	30	NM	52	NM	-36	NM	76	NM	3	NM	37	NM	48	NM	26	NM	36	NM	46	NM	70	
4-Mar-10	5	NM	65	NM	82	NM	-6	NM	47	NM	-22	NM	61	NM	3	NM	36	NM	29	NM	14	NM	17	NM	26	NM	61	
25-Mar-10	NM	-19	NM	37	NM	38	NM	15	NM	-21	NM	8	NM	306	NM	140	NM	120	NM	127	NM	3	NM	13	NM	43	NM	
15-Apr-10	17	NM	68	NM	64	NM	84	NM	2	NM	-35	NM	58	NM	-11	NM	27	NM	43	NM	-20	NM	15	NM	10	NM	30	
29-Apr-10	NM	-8	NM	29	NM	37	NM	-2	NM	18	NM	-8	NM	227	NM	-3	NM	13	NM	28	NM	-12	NM	-1	NM	23	NM	
20-May-10	4	NM	47	NM	58	NM	68	NM	7	NM	-55	NM	24	NM	4	NM	-12	NM	-4	NM	-33	NM	-26	NM	4	NM	42	
3-Jun-10	NM	-14	NM	8	NM	21	NM	21	NM	17	NM	-11	NM	102	NM	-26	NM	-12	NM	8	NM	-24	NM	-26	NM	-22	NM	
17-Jun-10	8	NM	59	NM	60	NM	80	NM	-3	NM	-31	NM	6	NM	-24	NM	5	NM	15	NM	-49	NM	-13	NM	-15	NM	18	
13-Jul-10	NM	NM	NM	NM	NM	NM	74	NM	70	NM	22	NM	98	NM	48	NM	76	NM	62	NM	30	NM	60	NM	35	NM		
29-Jul-10	-80	NM	-28	NM	-21	NM	-4	NM	11	NM	16	NM	28	NM	-2	NM	20	NM	15	NM	9	NM	23	NM	48	NM	35	
12-Aug-10	NM	27	NM	31	NM	39	NM	52	NM	54	NM	37	NM	71	NM	92	NM	85	NM	62	NM	55	NM	57	NM	55	NM	
26-Aug-10	-15	NM	13	NM	13	NM	37	NM	25	NM	25	NM	4	NM	8	NM	26	NM	28	NM	26	NM	31	NM	39	NM	45	
9-Sep-10	NM	-12	NM	3	NM	9	NM	19	NM	34	NM	34	NM	42	NM	24	NM	25	NM	35	NM	38	NM	42	NM	37	NM	
23-Sep-10	-25	NM	-9	NM	-10	NM	15	NM	4	NM	4	NM	5	NM	16	NM	30	NM	24	NM	23	NM	29	NM	39	NM	31	
7-Oct-10	NM	7	NM	14	NM	10	NM	11	NM</td																			

TABLE 4b

SUNOCO-PHILADELPHIA REFINERY, 26TH STREET (AOI-1)
SUMMARY OF OXYGEN INJECTION REMEDIATION SYSTEM ORP FIELD DATA
DEEP WELLS ONLY



DATE	IW-1D	IW-2D	IW-3D	IW-4D	IW-5D	IW-6D	IW-7D	IW-8D	IW-9D	IW-10D	IW-11D	IW-12D	IW-13D	IW-14D	IW-15D	IW-16D	IW-17D	IW-18D	IW-19D	IW-20D	IW-21D	IW-22D	IW-23D	IW-24D	IW-25D	IW-26D	IW-27D	
25-Mar-09	-43	-91	-105	-218	-153	-75	-8	-83	-53	-145	-27	-148	-160	-124	-126	-172	-186	-179	-170	-231	-144	-151	-164	-203	-182	-144	-33	
8-Apr-09	-58	139	167	24	292	262	353	320	325	323	311	288	292	290	352	317	201	245	282	211	334	162	280	268	304.8	255	322	
15-Apr-09	5	21	NM-I	29	66	-3	11	40	55	48	8	41	51	40	26	NM	NM											
22-Apr-09	NM	NM	NM	NM	NM	42	4	4	53	28	99	-35	46	74	16	-9	45	NM										
6-May-09	29	NM	189	NM	188	NM	290	NM	277	NM	302	NM	284	NM	251	NM	228	NM	307	NM	336	NM	317	NM	276	NM	341	
21-May-09	NM	39.77	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM								
4-Jun-09	-120	NM	109	NM	55	NM	42	NM	100	NM	110	NM	54	NM	80	NM	34	NM	29.6	NM	74	NM	135	NM	138	NM	185	
23-Jun-09	NM	48	NM	43	NM	123	NM	144	NM	152	NM	153	NM	197	NM	179	NM	13	NM	8	NM	76	NM	149	NM	6	NM	
8-Jul-09	-144	NM	56	NM	-2	NM	27	NM	51	NM	56	NM	23	NM	26	NM	24	NM	47	NM	84	NM	112	NM	59	NM	65	
22-Jul-09	NM	18	NM	44	NM	93	NM	87	NM	90	NM	94	NM	89	NM	53	NM	22	NM	23	NM	27	NM	-18	NM	40	NM	
4-Aug-09	-3	NM	-159	NM	-36	NM	11	NM	32	NM	-35	NM	54	NM	-44	NM	34	NM	17	NM	-4	NM	31	NM	23	NM	74	
19-Aug-09	NM	12	NM	-2	NM	41	NM	52	NM	46	NM	56	NM	75	NM	40	NM	28	NM	62	NM	43	NM	-22	NM	-4	NM	
9-Sep-09	-150	NM	48	NM	-41	NM	-5	NM	32	NM	37	NM	3	NM	17	NM	4	NM	3	NM	30	NM	49	NM	43	NM	72	
23-Sep-09	NM	30	NM	9	NM	78	NM	106	NM	113	NM	133	NM	120	NM	45	NM	39	NM	1	NM	43	NM	43	NM	-10	NM	
7-Oct-09	-168	NM	3	NM	-39	NM	-15	NM	8	NM	23	NM	-12	NM	22	NM	-13	NM	-3	NM	34	NM	30	NM	38	NM	60	
21-Oct-09	NM	44	NM	-25	NM	28	NM	76	NM	68	NM	111	NM	107	NM	7	NM	44	NM	27	NM	-12	NM	-31	NM	-10	NM	
18-Nov-09	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	-27	32	47	61	-16	38										
2-Dec-09	-12	NM	39	NM	4	NM	58	NM	76	NM	-9	NM	55	NM	43	NM	75	NM	77	NM	66	NM	94	NM	84	NM	72	
16-Dec-09	NM	110	NM	108	NM	-4	NM	18	NM	28	NM	32	NM	45	NM	-16	NM	-10	NM	32	NM	-41	NM	-4	NM	43	NM	
30-Dec-09	-158	NM	12	NM	7	NM	45	NM	11	NM	42	NM	-26	NM	4	NM	16	NM	27	NM	53	NM	17	NM	31	NM	54	
14-Jan-10	NM	52	NM	96	NM	121	NM	43	NM	57	NM	111	NM	39	NM	167	NM	114	NM	127	NM	-28	NM	34	NM	84	NM	
28-Jan-10	-144	NM	72	NM	56	NM	-6	NM	30	NM	39	NM	-6	NM	-39	NM	4	NM	38	NM	30	NM	20	NM	41	NM	56	
4-Mar-10	-148	NM	54	NM	87	NM	-42	NM	12	NM	35	NM	-13	NM	-35	NM	19	NM	3	NM	25	NM	-11	NM	28	NM	44	
25-Mar-10	NM	-35	NM	-6	NM	23	NM	29	NM	-41	NM	-10	NM	10	NM	152	NM	125	NM	105	NM	-66	NM	-4	NM	27	NM	
15-Apr-10	-138	NM	42	NM	77	NM	76	NM	-52	NM	-6	NM	-23	NM	-43	NM	26	NM	28	NM	-49	NM	-8	NM	15	NM	25	
29-Apr-10	NM	-13	NM	3	NM	17	NM	-16	NM	-3	NM	5	NM	-25	NM	-34	NM	6	NM	-3	NM	-70	NM	-14	NM	8	NM	
20-May-10	NM	17	NM	52	NM	68	NM	-31	NM	6	NM	-59	NM	-14	NM	-20	NM	-20	NM	-59	NM	-65	NM	-15	NM	31		
3-Jun-10	NM	-6	NM	-7	NM	1	NM	20	NM	9	NM	-24	NM	230	NM	-51	NM	-22	NM	-17	NM	-63	NM	-36	NM	-27	NM	
17-Jun-10	-221	NM	39	NM	58	NM	65	NM	-36	NM	-4	NM	-32	NM	-45	NM	-6	NM	-4	NM	-70	NM	-34	NM	-18	NM	7	
40372	NM	23	NM	82	NM	43	NM	430	NM	1	NM	63	NM	18	NM	-69	NM	27	NM	-44								
29-Jul-10	-187	NM	-57	NM	-18	NM	-13	NM	7	NM	12	NM	15	NM	-24	NM	8	NM	-7	NM	8	NM	3	NM	41	NM	42	
12-Aug-10	NM	12	NM	11	NM	8	NM	27	NM	35	NM	38	NM	35	NM	89	NM	82	NM	69	NM	52	NM	56	NM	48	NM	
26-Aug-10	-65	NM	-19	NM	13	NM	19	NM	6	NM	23	NM	-10	NM	-21	NM	16	NM	16	NM	18	NM	7	NM	43	NM	33	
9-Sep-10	NM	7	NM	-10	NM	18	NM	2	NM	23	NM	35	NM	40	NM	8	NM	15	NM	23	NM	37	NM	45	NM	33	NM	
23-Sep-10	-92	NM	-29	NM	-14	NM	-5	NM	-3	NM	2	NM	1	NM	2	NM	22	NM	13	NM	18	NM	13	NM	32	NM	30	
7-Oct-10	NM	-24	NM	-15	NM	11	NM	-10	NM	4	NM	-3	NM	5														



ATTACHMENT A

Groundwater Laboratory Analytical Data



03/12/13



Technical Report for

Aquaterra Technologies, Inc.

Sun-Philadelphia Refinery, 3144 Passyunk Avenue, Philadelphia, PA

AOI-1

Accutest Job Number: JB27170

Sampling Date: 01/15/13

Report to:

AquaTerra Terra Technologies, Inc.

td@aquaterra-tech.com

ATTN: Tiffani Doerr

Total number of pages in report: 12



Test results contained within this data package meet the requirements
of the National Environmental Laboratory Accreditation Conference
and/or state specific certification programs as applicable.

Nancy Cole
Laboratory Director

Client Service contact: Kristin Beebe 732-329-0200

Certifications: NJ(12129), NY(10983), CA, CT, DE, FL, IL, IN, KS, KY, LA, MA, MD, MI, MT, NC,
OH VAP (CL0056), PA, RI, SC, TN, VA, WV

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Test results relate only to samples analyzed.

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Sample Summary

Aquaterra Technologies, Inc.

Job No: JB27170

Sun-Philadelphia Refinery, 3144 Passyunk Avenue, Philadelphia, PA
Project No: AOI-1

Sample Number	Collected Date	Time By	Matrix Received	Code Type	Client Sample ID
JB27170-1	01/15/13	09:00 LM	01/23/13	AQ	Ground Water
JB27170-2	01/15/13	10:00 LM	01/23/13	AQ	Ground Water
JB27170-3	01/15/13	11:00 LM	01/23/13	AQ	Ground Water



CASE NARRATIVE / CONFORMANCE SUMMARY

Client: Aquaterra Technologies, Inc.

Job No JB27170

Site: Sun-Philadelphia Refinery, 3144 Passyunk Avenue, Philadelphia, P

Report Date 2/6/2013 9:20:33 AM

On 01/23/2013, 3 Sample(s), 0 Trip Blank(s) and 0 Field Blank(s) were received at Accutest Laboratories at a temperature of 1.5 C. Samples were intact and chemically preserved, unless noted below. An Accutest Job Number of JB27170 was assigned to the project. Laboratory sample ID, client sample ID and dates of sample collection are detailed in the report's Results Summary Section.

Specified quality control criteria were achieved for this job except as noted below. For more information, please refer to the analytical results and QC summary pages.

Volatiles by GCMS By Method SW846 8260B

Matrix: AQ

Batch ID: V2V53

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB27170-3MS, JB27170-3MSD were used as the QC samples indicated.

Matrix: AQ

Batch ID: V2V54

- All samples were analyzed within the recommended method holding time.
- All method blanks for this batch meet method specific criteria.
- Sample(s) JB27264-1MS, JB27264-1MSD were used as the QC samples indicated.

Accutest certifies that data reported for samples received, listed on the associated custody chain or analytical task order, were produced to specifications meeting Accutest's Quality System precision, accuracy and completeness objectives except as noted.

Estimated non-standard method measurement uncertainty data is available on request, based on quality control bias and implicit for standard methods. Acceptable uncertainty requires tested parameter quality control data to meet method criteria.

Accutest Laboratories is not responsible for data quality assumptions if partial reports are used and recommends that this report be used in its entirety. Data release is authorized by Accutest Laboratories indicated via signature on the report cover

Summary of Hits

Job Number: JB27170

Account: Aquaterra Technologies, Inc.

Project: Sun-Philadelphia Refinery, 3144 Passyunk Avenue, Philadelphia, PA

Collected: 01/15/13

Lab Sample ID Analyte	Client Sample ID	Result/ Qual	RL	MDL	Units	Method
--------------------------	------------------	-----------------	----	-----	-------	--------

JB27170-1 S-50

Benzene	671	10	ug/l	SW846 8260B
Toluene	8.6	2.0	ug/l	SW846 8260B
Ethylbenzene	20.4	2.0	ug/l	SW846 8260B
Xylene (total)	3.7	2.0	ug/l	SW846 8260B

JB27170-2 S-230

Benzene	1190	10	ug/l	SW846 8260B
Toluene	1.4	1.0	ug/l	SW846 8260B
Ethylbenzene	7.7	1.0	ug/l	SW846 8260B
Xylene (total)	3.8	1.0	ug/l	SW846 8260B

JB27170-3 S-232

No hits reported in this sample.



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Sample Results

Report of Analysis

Report of Analysis

Page 1 of 1

Client Sample ID:	S-50	Date Sampled:	01/15/13
Lab Sample ID:	JB27170-1	Date Received:	01/23/13
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	SW846 8260B		
Project:	Sun-Philadelphia Refinery, 3144 Passyunk Avenue, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2V1082.D	2	01/29/13	RFY	n/a	n/a	V2V53
Run #2	2V1086.D	10	01/29/13	RFY	n/a	n/a	V2V53

Purge Volume	
Run #1	5.0 ml
Run #2	5.0 ml

Purgeable Aromatics, MTBE

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	671 ^a	10	ug/l	
108-88-3	Toluene	8.6	2.0	ug/l	
100-41-4	Ethylbenzene	20.4	2.0	ug/l	
1330-20-7	Xylene (total)	3.7	2.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	2.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	106%	106%	81-121%
17060-07-0	1,2-Dichloroethane-D4	109%	109%	74-127%
2037-26-5	Toluene-D8	112%	112%	80-122%
460-00-4	4-Bromofluorobenzene	107%	108%	78-116%

(a) Result is from Run# 2

ND = Not detected

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

4.2

4

Client Sample ID:	S-230	Date Sampled:	01/15/13
Lab Sample ID:	JB27170-2	Date Received:	01/23/13
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	SW846 8260B		
Project:	Sun-Philadelphia Refinery, 3144 Passyunk Avenue, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2V1087.D	1	01/29/13	RFY	n/a	n/a	V2V53
Run #2	2V1105.D	10	01/29/13	RFY	n/a	n/a	V2V54

Purge Volume	
Run #1	5.0 ml
Run #2	5.0 ml

Purgeable Aromatics, MTBE

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	1190 ^a	10	ug/l	
108-88-3	Toluene	1.4	1.0	ug/l	
100-41-4	Ethylbenzene	7.7	1.0	ug/l	
1330-20-7	Xylene (total)	3.8	1.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	108%	106%	81-121%
17060-07-0	1,2-Dichloroethane-D4	112%	110%	74-127%
2037-26-5	Toluene-D8	111%	111%	80-122%
460-00-4	4-Bromofluorobenzene	107%	108%	78-116%

(a) Result is from Run# 2

ND = Not detected

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

4.3
4

Client Sample ID:	S-232	Date Sampled:	01/15/13
Lab Sample ID:	JB27170-3	Date Received:	01/23/13
Matrix:	AQ - Ground Water	Percent Solids:	n/a
Method:	SW846 8260B		
Project:	Sun-Philadelphia Refinery, 3144 Passyunk Avenue, Philadelphia, PA		

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	2V1104.D	1	01/29/13	RFY	n/a	n/a	V2V54
Run #2							

Purge Volume	
Run #1	5.0 ml
Run #2	

Purgeable Aromatics, MTBE

CAS No.	Compound	Result	RL	Units	Q
71-43-2	Benzene	ND	1.0	ug/l	
108-88-3	Toluene	ND	1.0	ug/l	
100-41-4	Ethylbenzene	ND	1.0	ug/l	
1330-20-7	Xylene (total)	ND	1.0	ug/l	
1634-04-4	Methyl Tert Butyl Ether	ND	1.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
1868-53-7	Dibromofluoromethane	106%		81-121%
17060-07-0	1,2-Dichloroethane-D4	111%		74-127%
2037-26-5	Toluene-D8	112%		80-122%
460-00-4	4-Bromofluorobenzene	107%		78-116%

ND = Not detected

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound



Misc. Forms

5

Custody Documents and Other Forms

Includes the following where applicable:

- Chain of Custody



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CHAIN OF CUSTODY

PAGE OF

2235 Route 130, Dayton, NJ 08810
TEL: 732-329-0200 FAX: 732-329-3499/3480
www.acctest.com

JB27170: Chain of Custody

Page 1 of 2



Accutest Laboratories Sample Receipt Summary

Accutest Job Number: JB27170

Client: _____

Project: _____

Date / Time Received: 1/23/2013

Delivery Method: _____

Airbill #'s: _____

Cooler Temps (Initial/Adjusted): #1: (1.8/1.8); 0

Cooler Security Y or N

- | | | | | | |
|---------------------------|-------------------------------------|--------------------------|-----------------------|-------------------------------------|--------------------------|
| 1. Custody Seals Present: | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 3. COC Present: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2. Custody Seals Intact: | <input checked="" type="checkbox"/> | <input type="checkbox"/> | 4. Smpl Dates/Time OK | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Cooler Temperature Y or N

- | | | |
|------------------------------|-------------------------------------|--------------------------|
| 1. Temp criteria achieved: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2. Cooler temp verification: | _____ | |
| 3. Cooler media: | Ice (Bag) | |
| 4. No. Coolers: | 1 | |

Quality Control Preservation Y or N N/A

- | | | | |
|---------------------------------|-------------------------------------|-------------------------------------|--------------------------|
| 1. Trip Blank present / cooler: | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2. Trip Blank listed on COC: | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3. Samples preserved properly: | <input checked="" type="checkbox"/> | <input type="checkbox"/> | |
| 4. VOCs headspace free: | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Sample Integrity - DocumentationY or N

- | | | |
|--|-------------------------------------|--------------------------|
| 1. Sample labels present on bottles: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2. Container labeling complete: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3. Sample container label / COC agree: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |

Sample Integrity - ConditionY or N

- | | | |
|----------------------------------|-------------------------------------|--------------------------|
| 1. Sample recv'd within HT: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2. All containers accounted for: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 3. Condition of sample: | Intact | |

Sample Integrity - InstructionsY or N N/A

- | | | |
|---|-------------------------------------|-------------------------------------|
| 1. Analysis requested is clear: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 2. Bottles received for unspecified tests | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 3. Sufficient volume recv'd for analysis: | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| 4. Compositing instructions clear: | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Filtering instructions clear: | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Comments

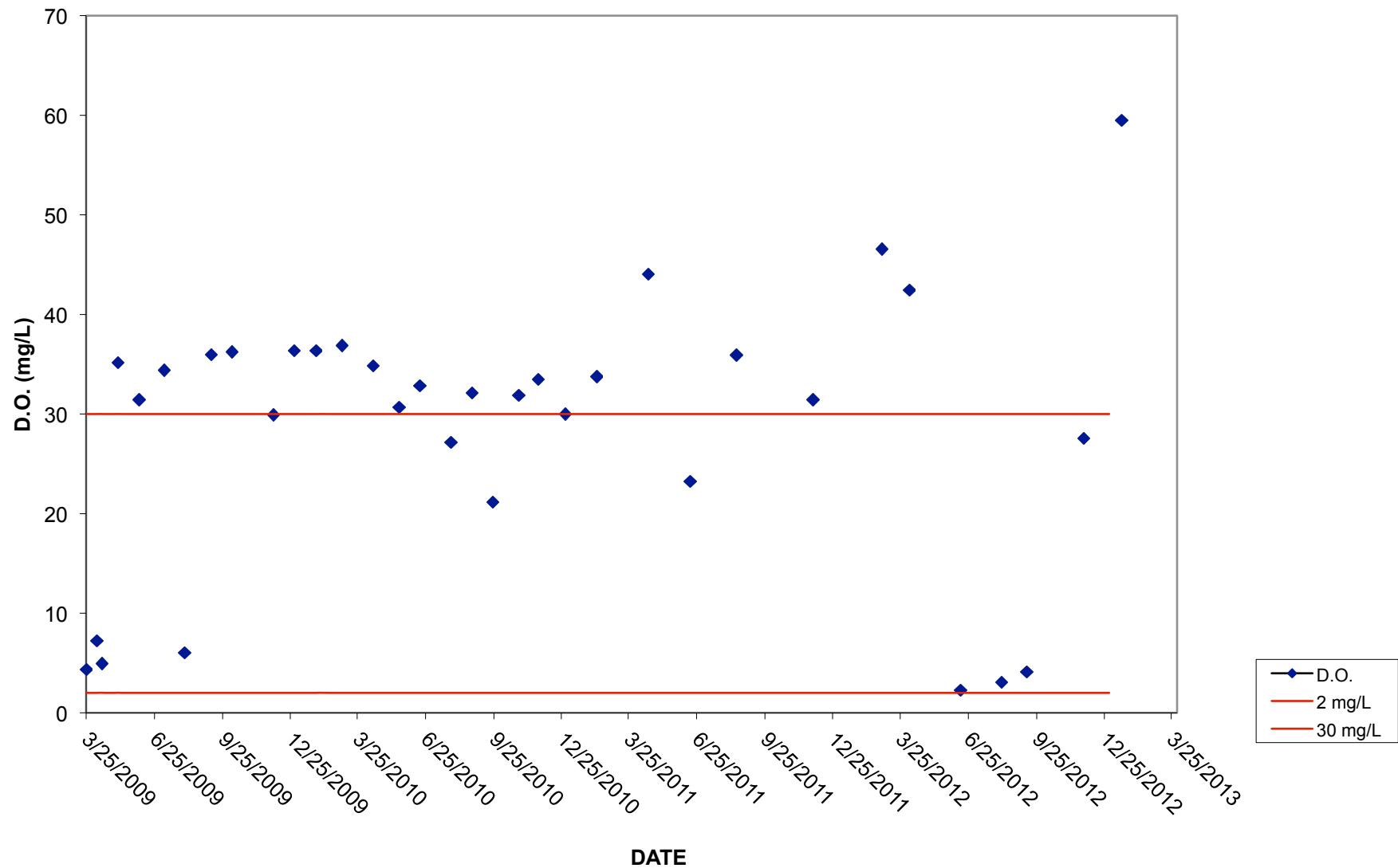
Accutest Laboratories
V:732.329.02002235 US Highway 130
F: 732.329.3499Dayton, New Jersey
www.accutest.com**JB27170: Chain of Custody****Page 2 of 2**



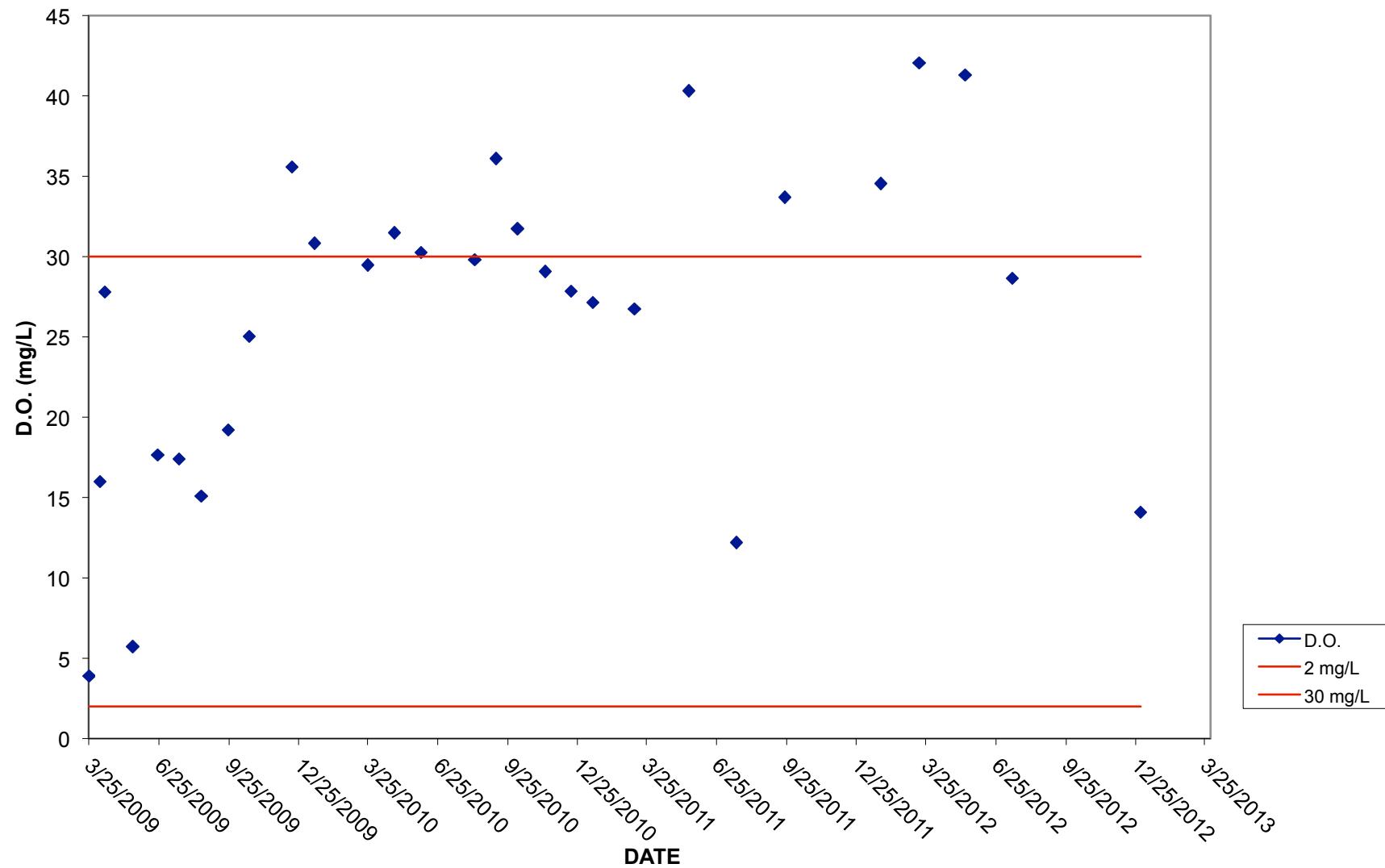
ATTACHMENT B

DO Graphs for System Wells

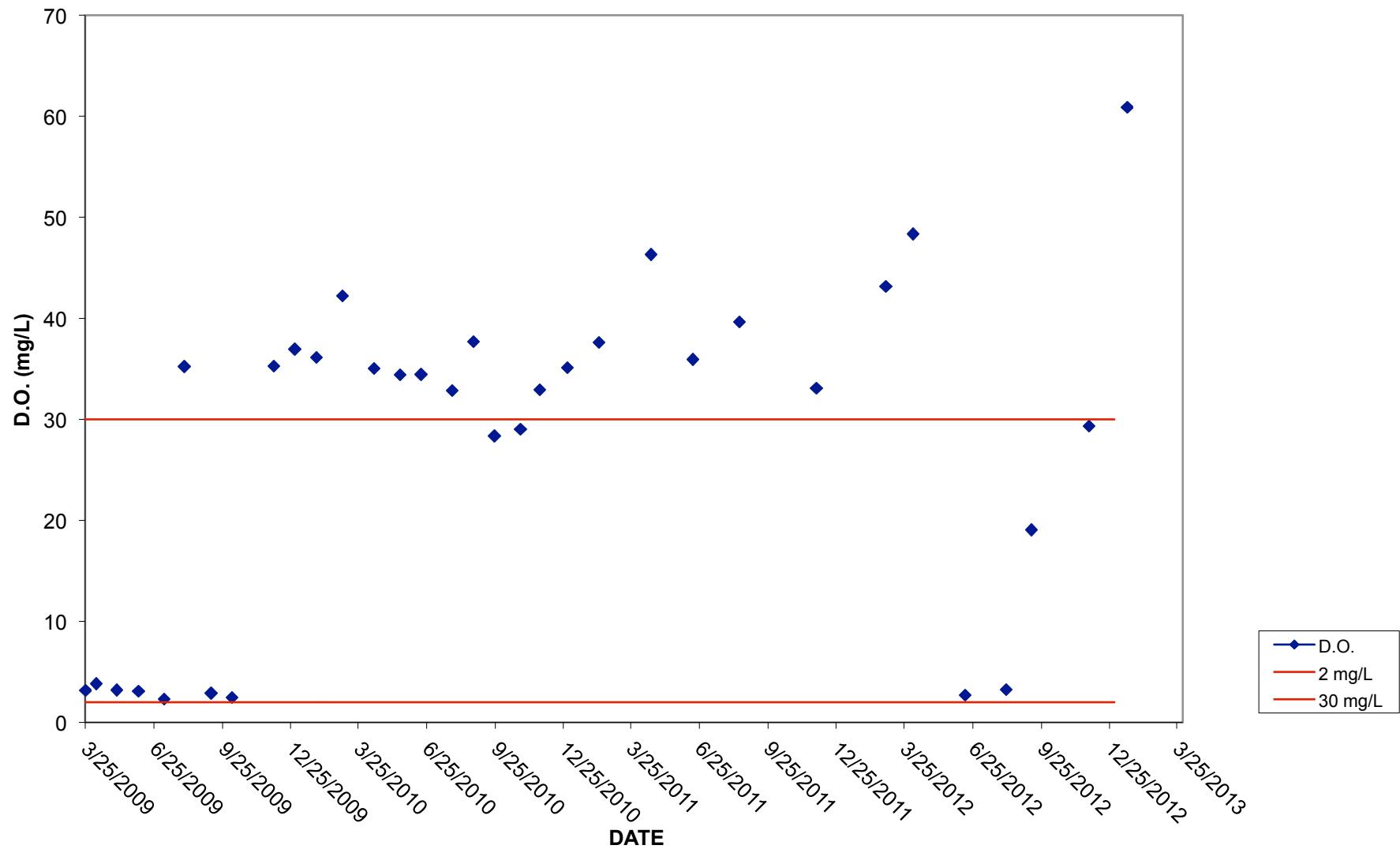
IW-1S D.O. FIELD DATA vs TIME



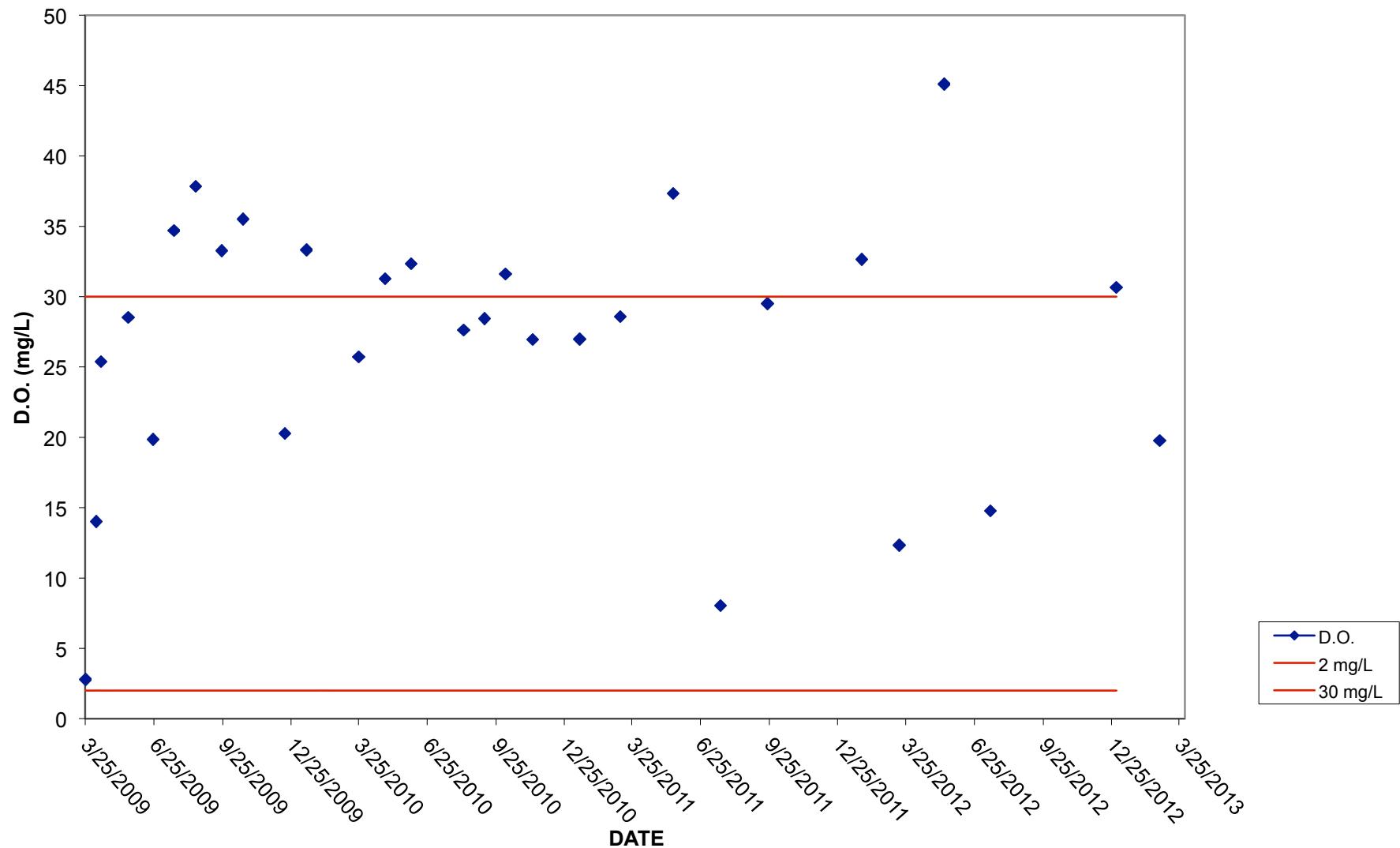
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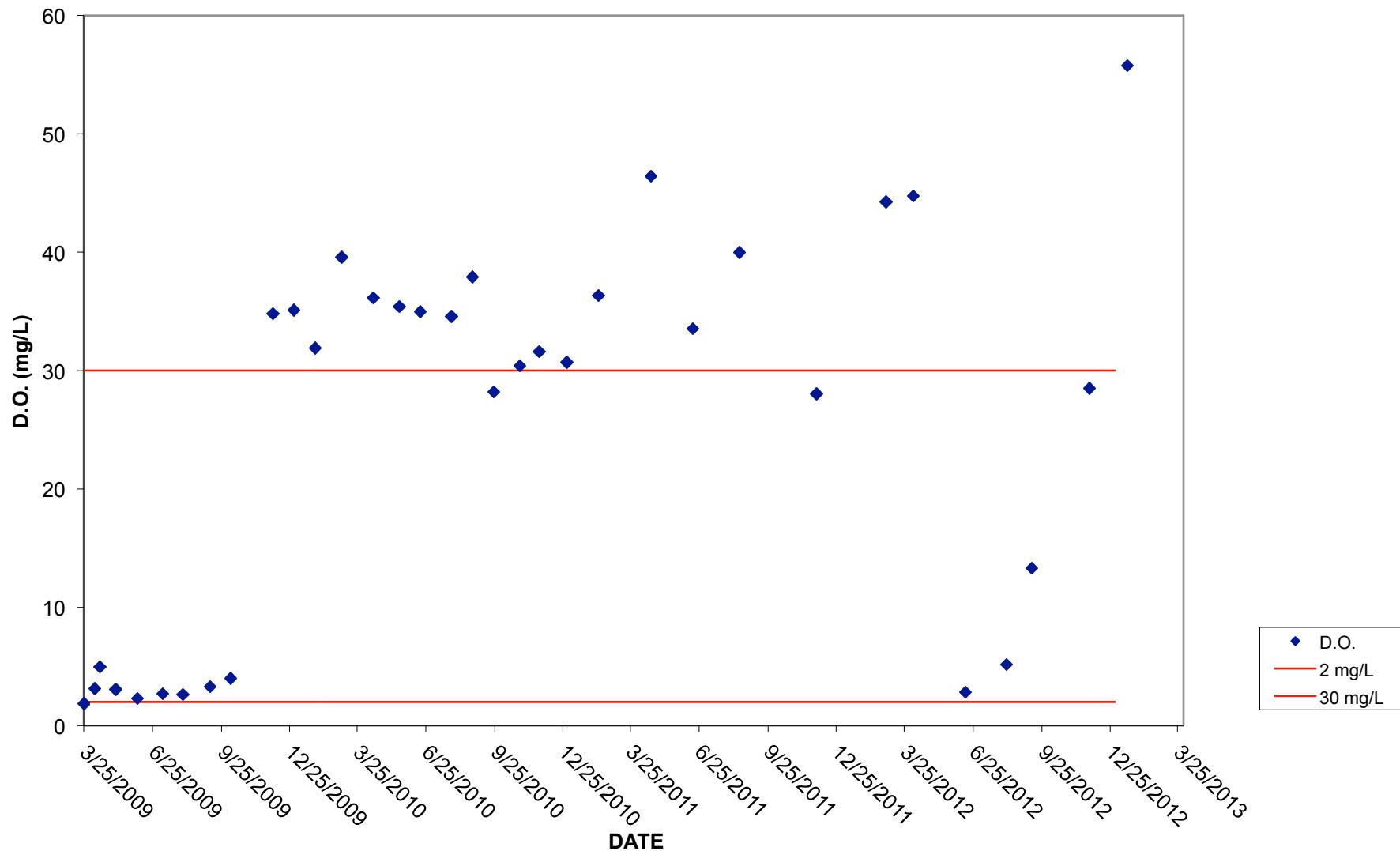
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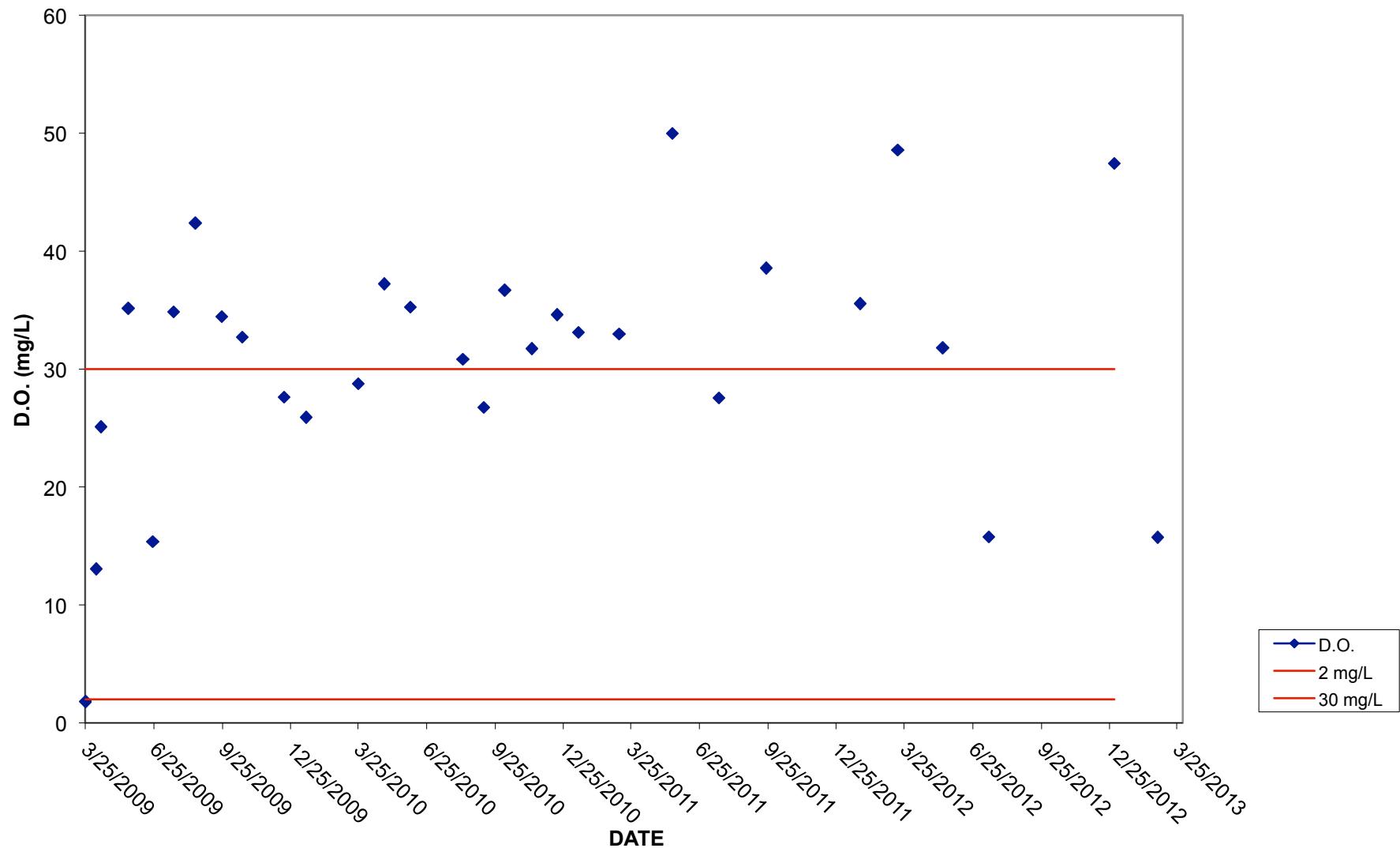
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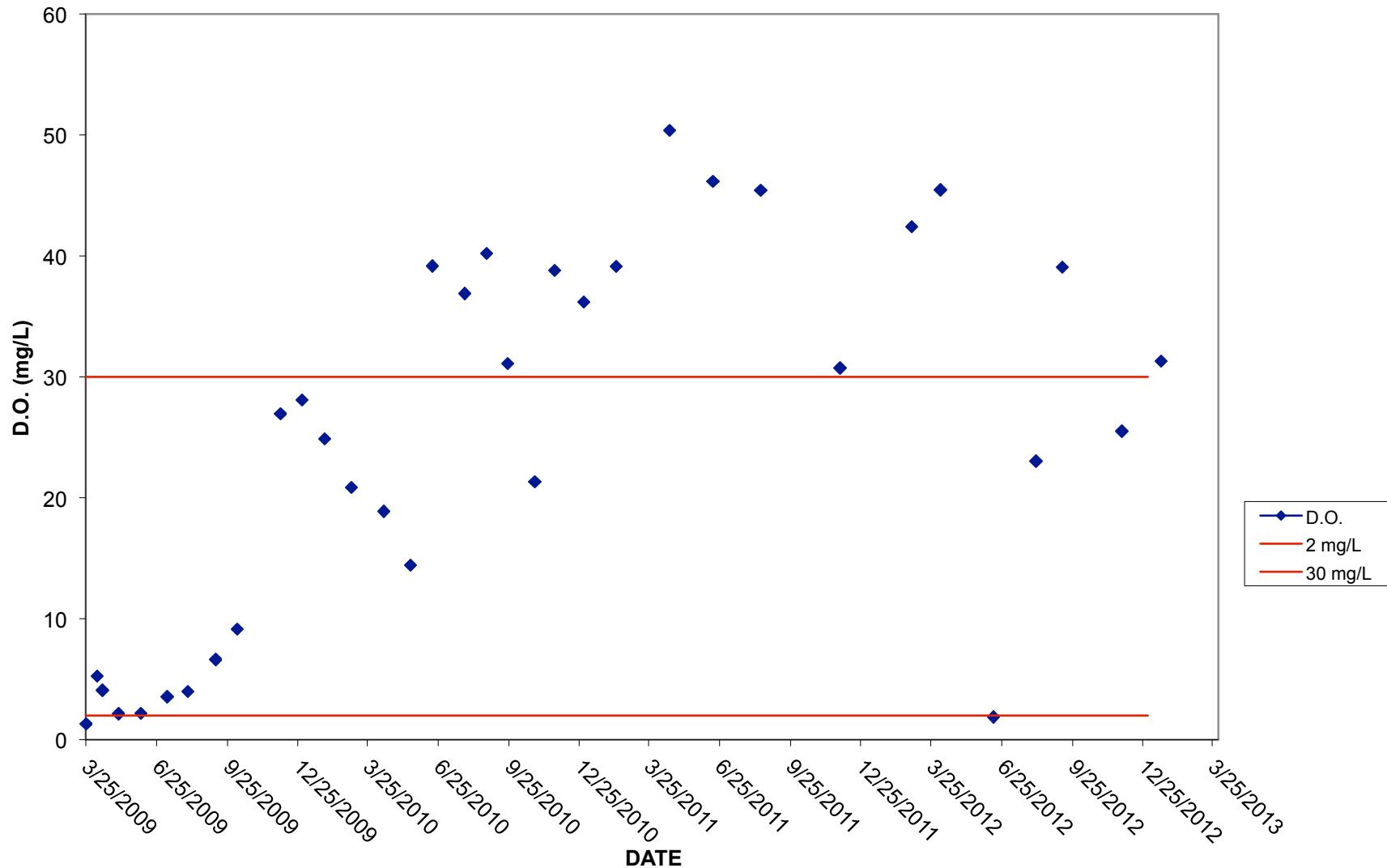
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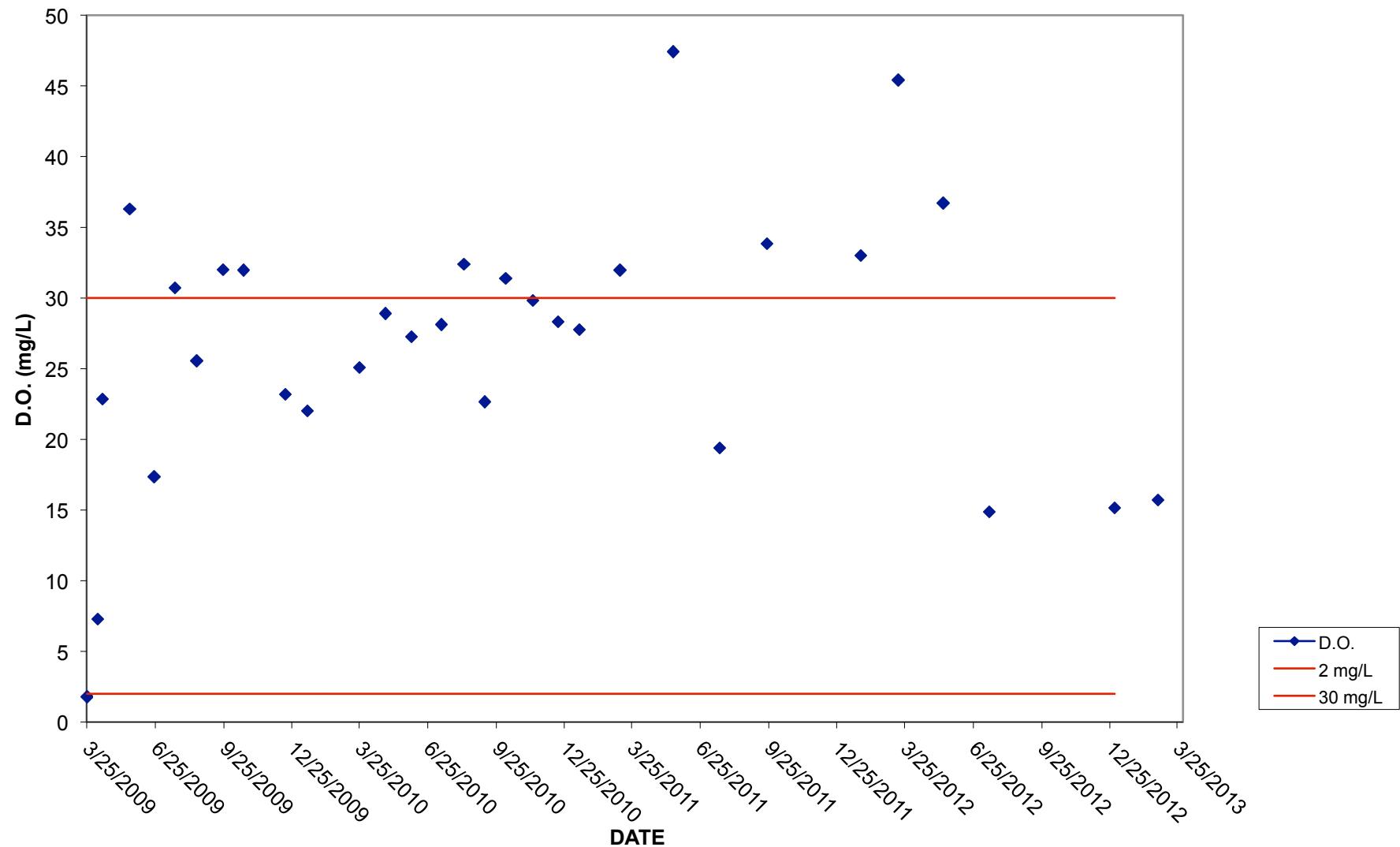
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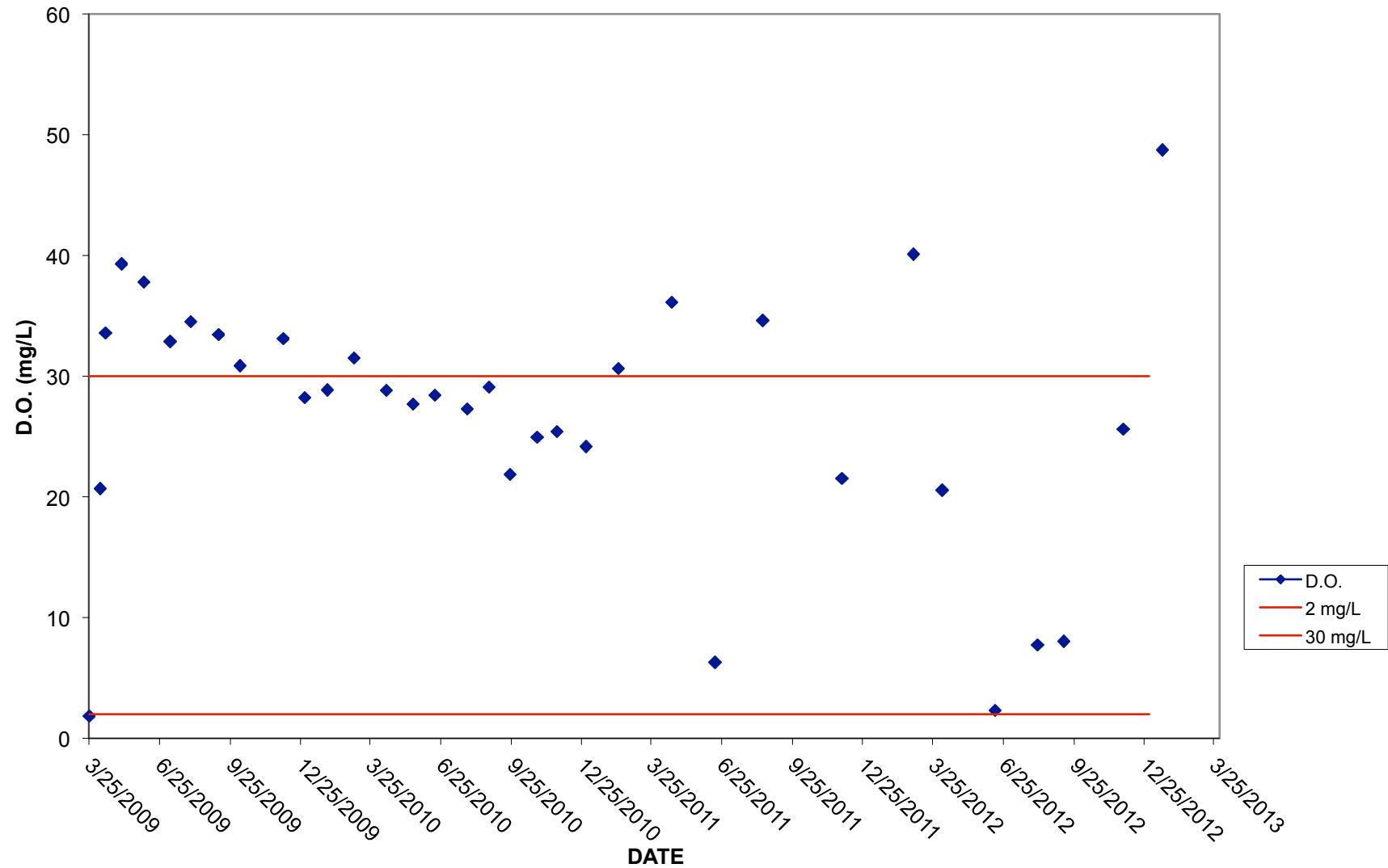
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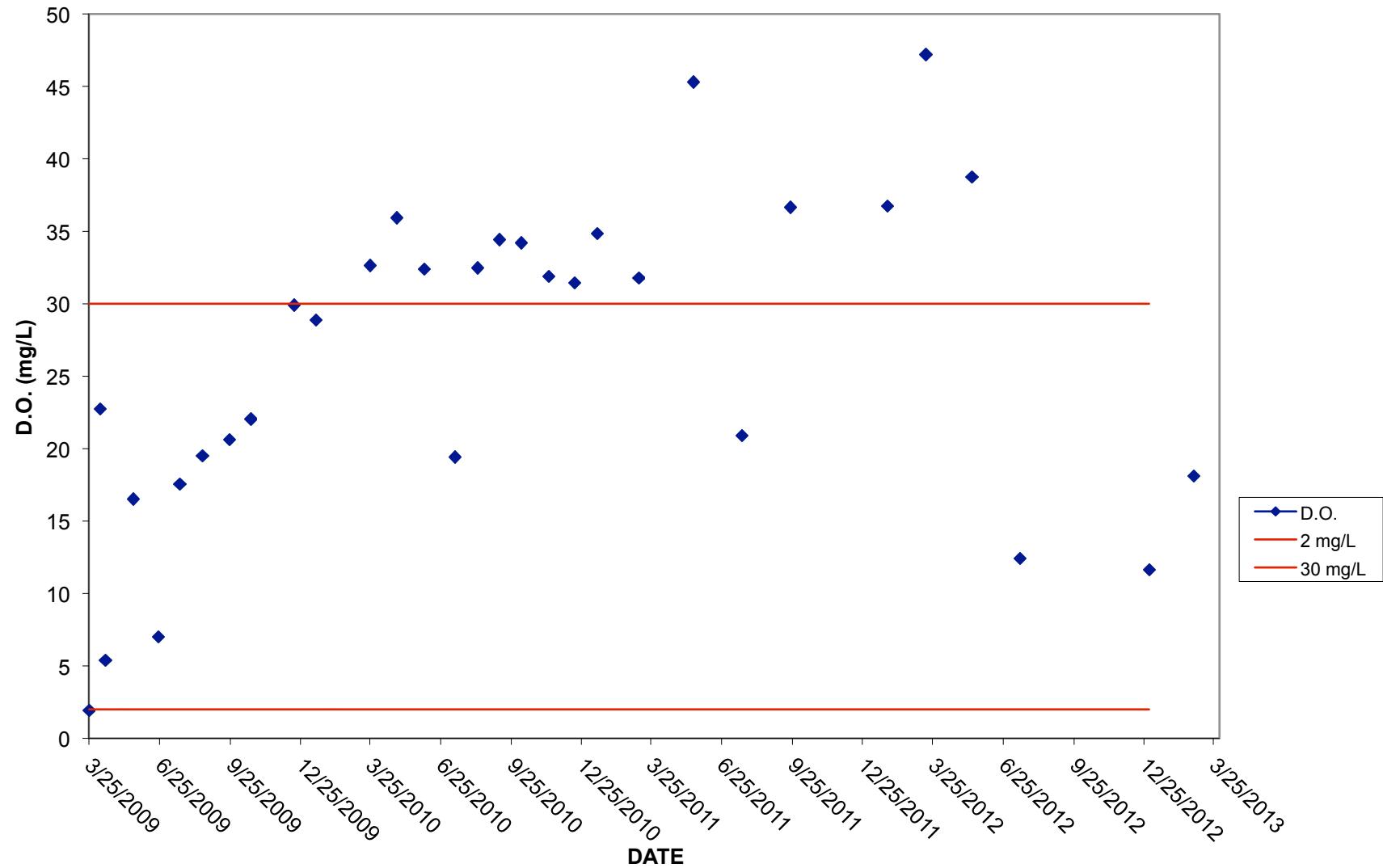
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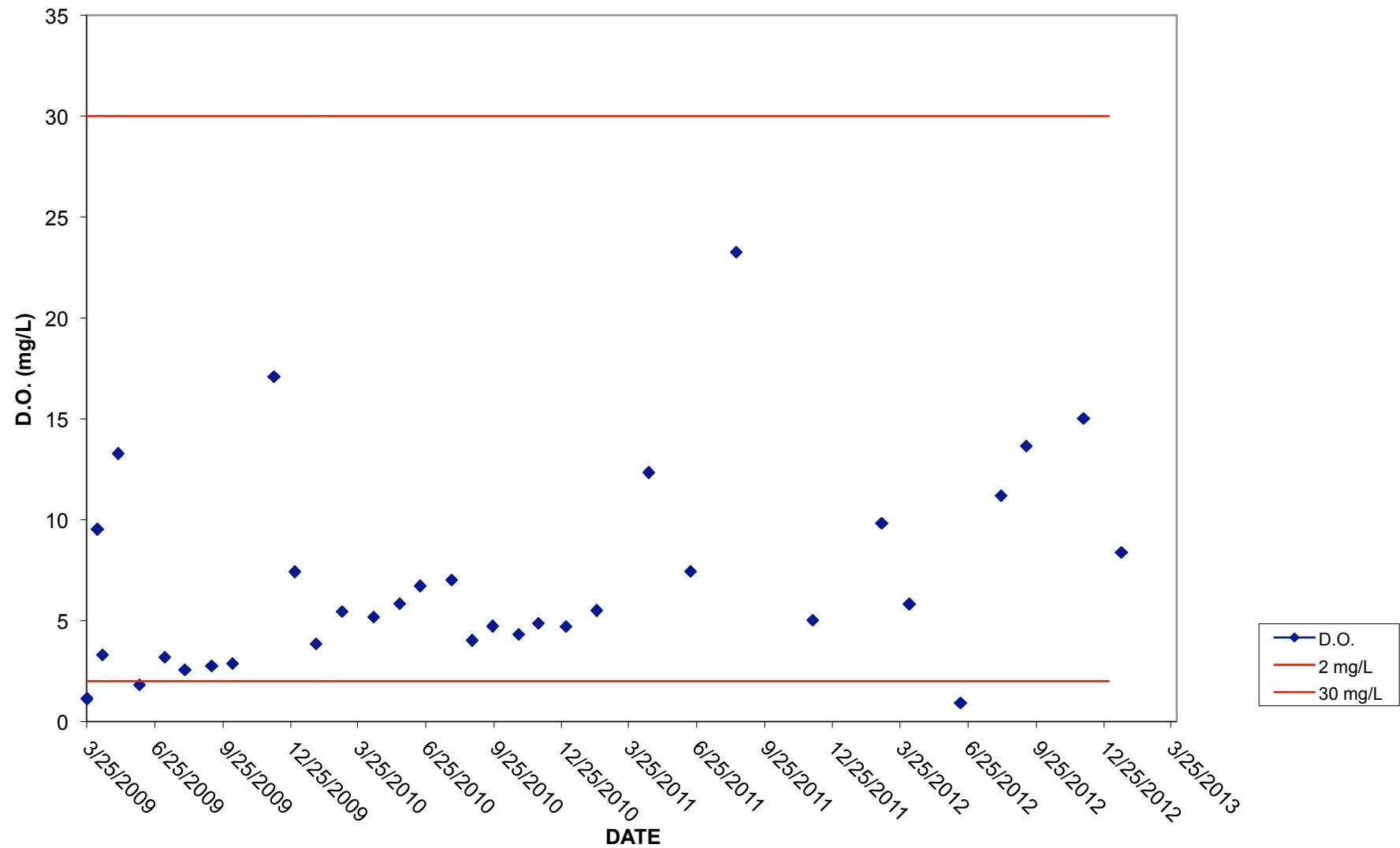
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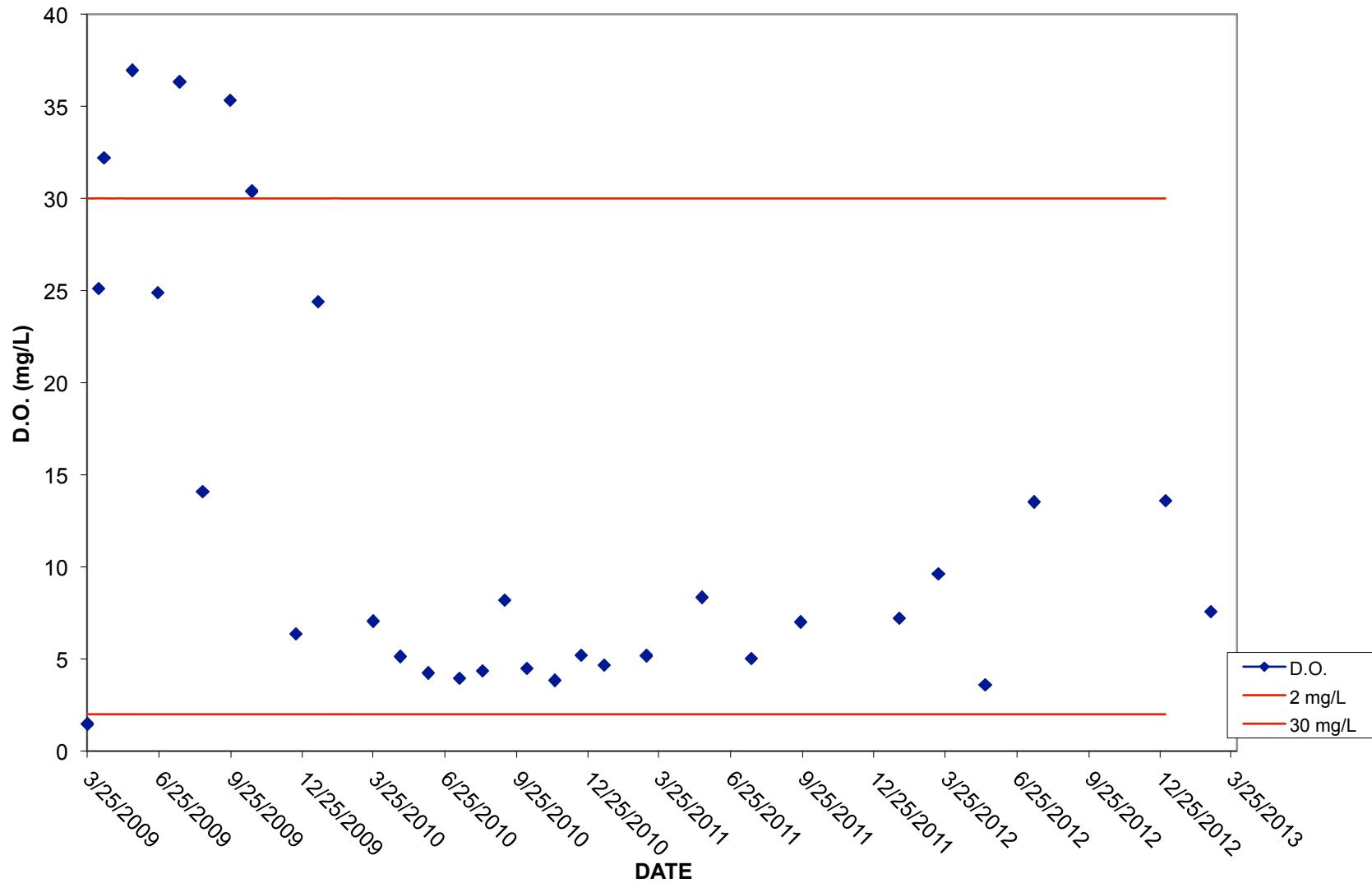
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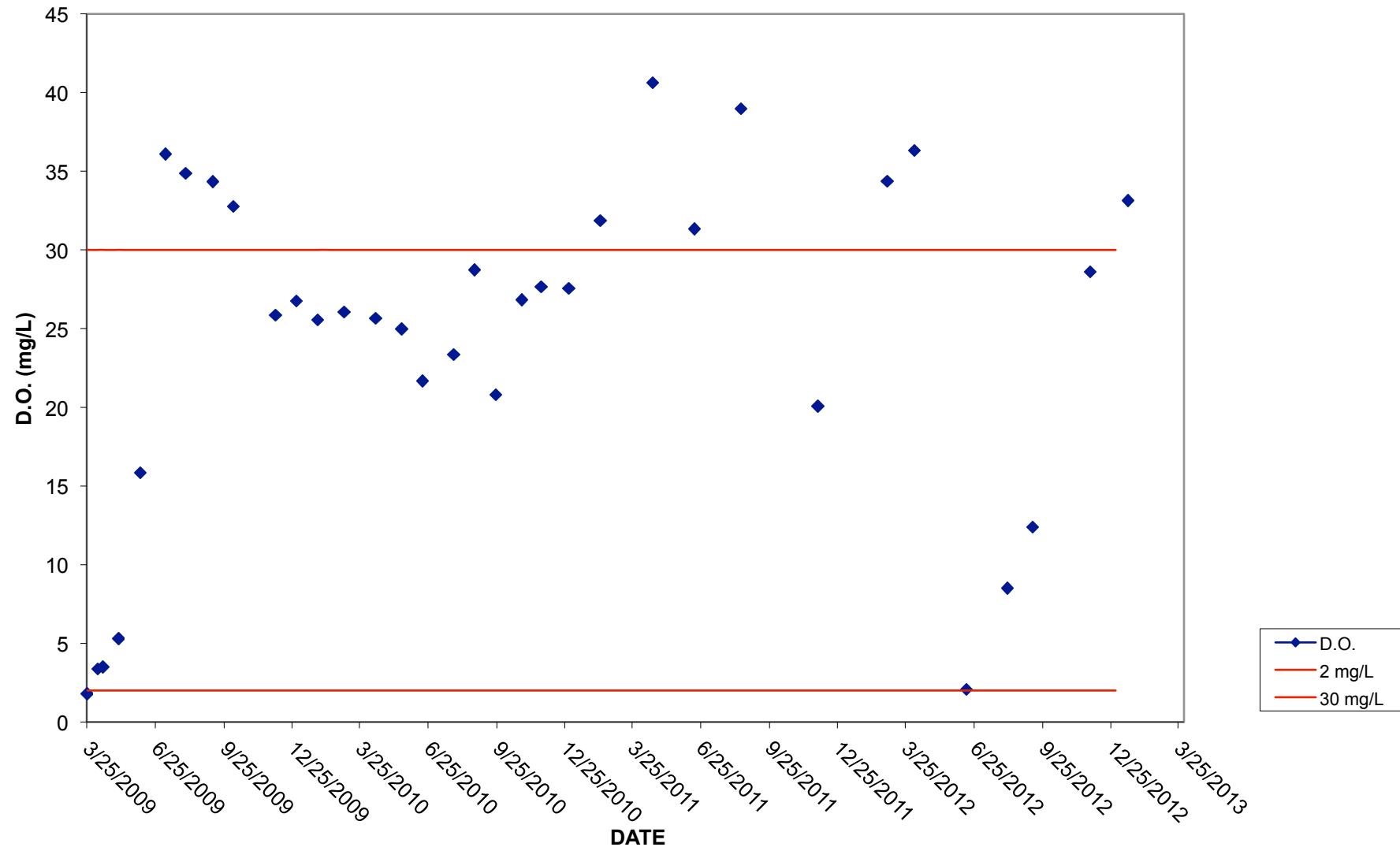
IW-11S D.O. FIELD DATA vs TIME



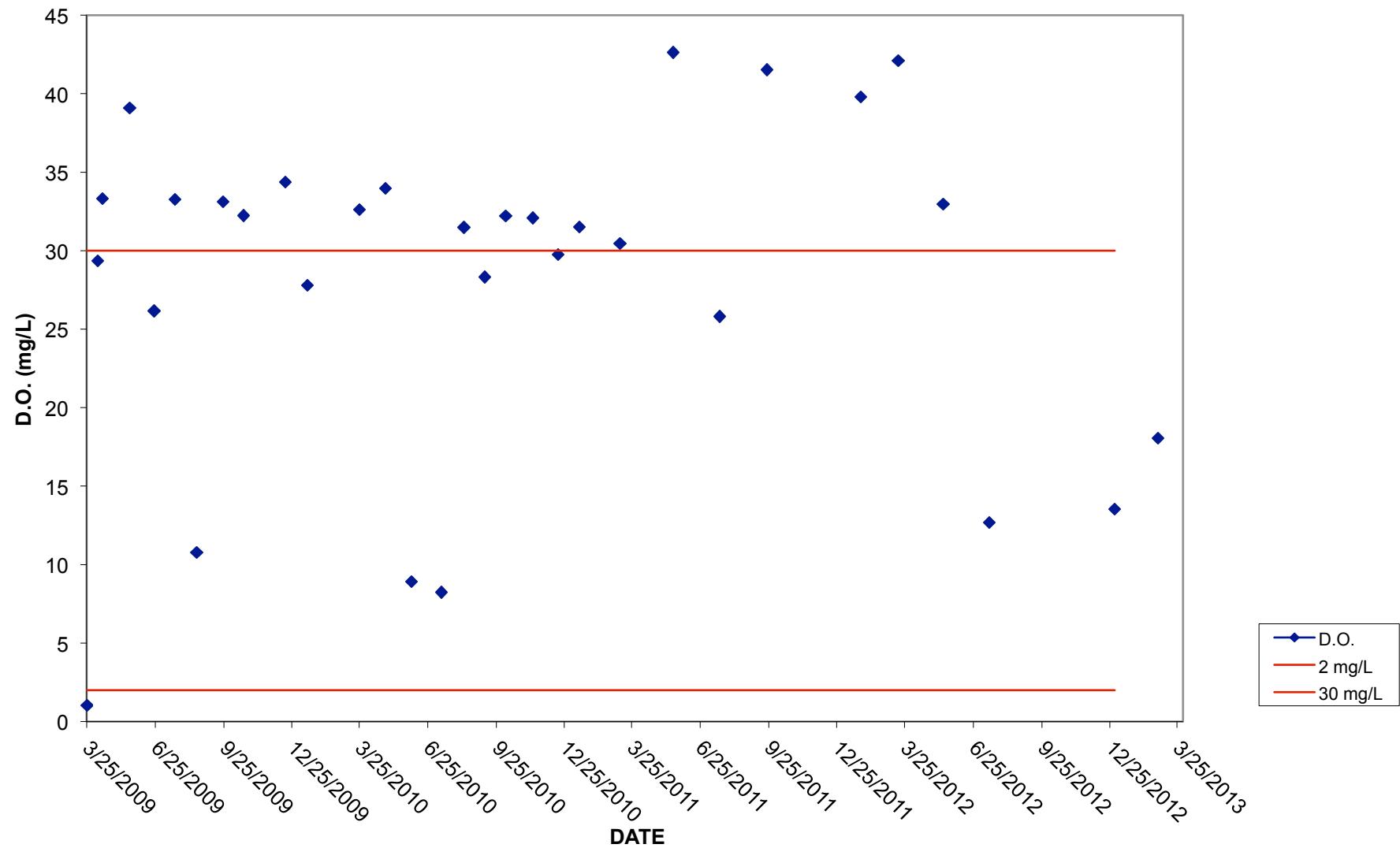
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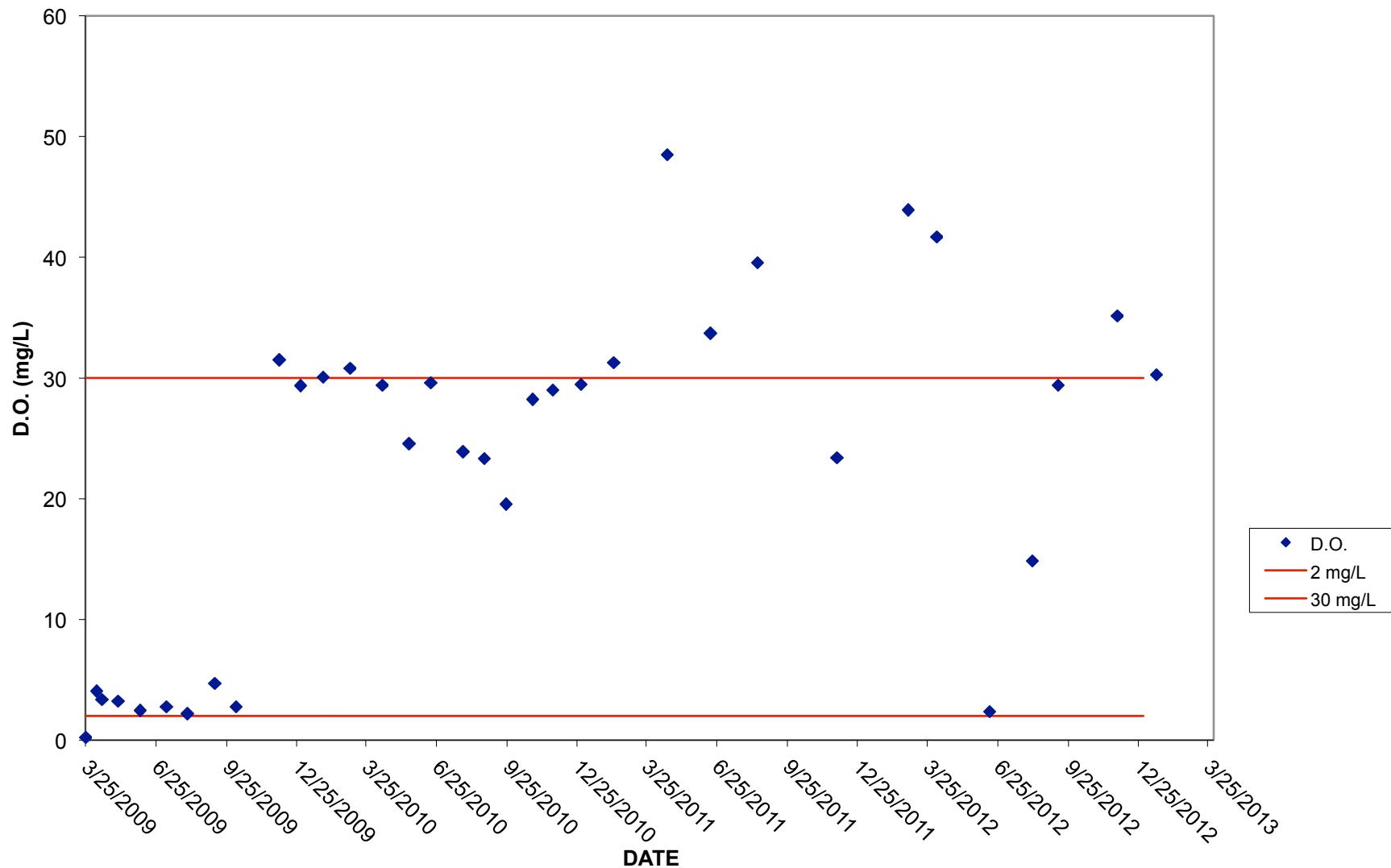
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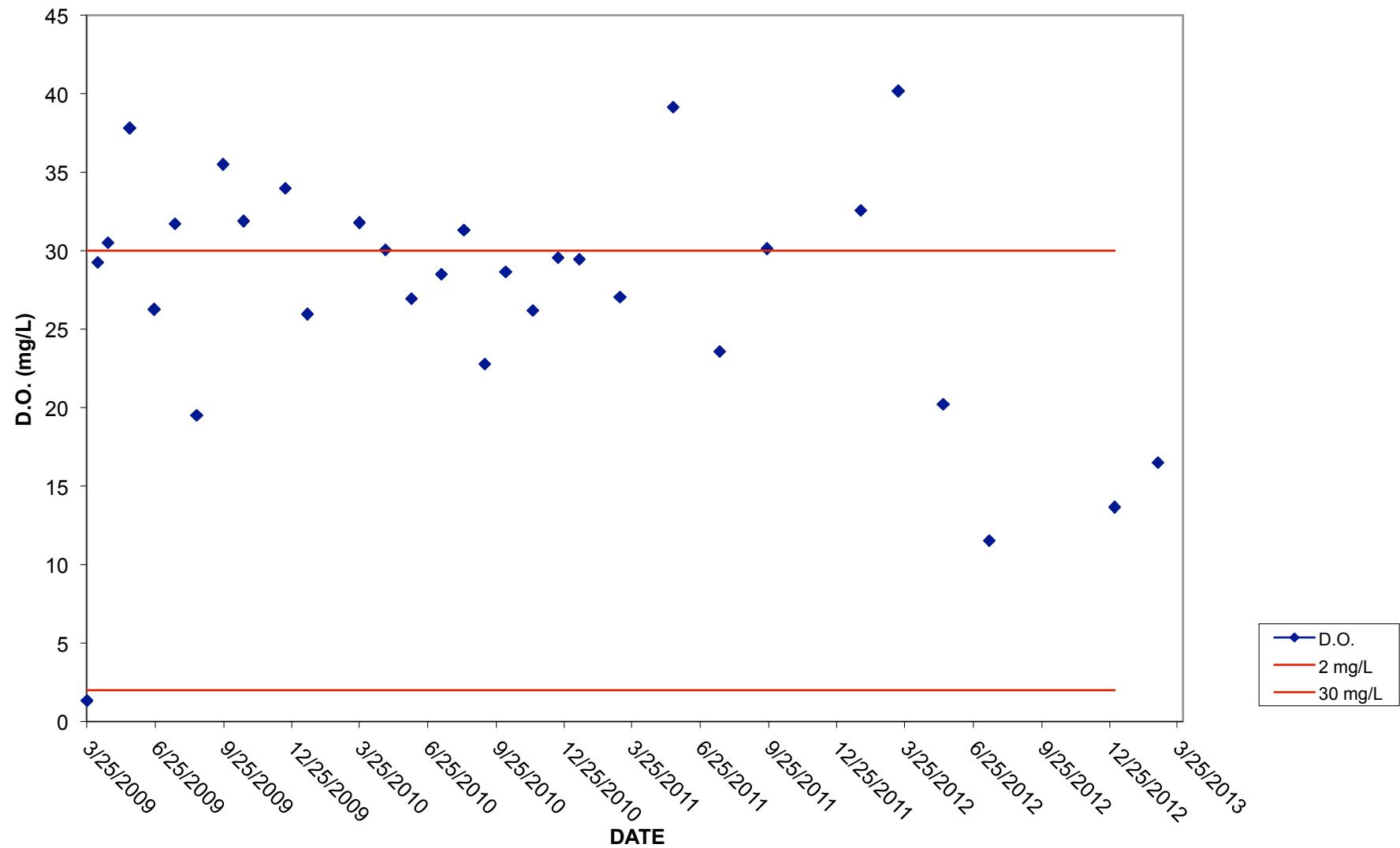
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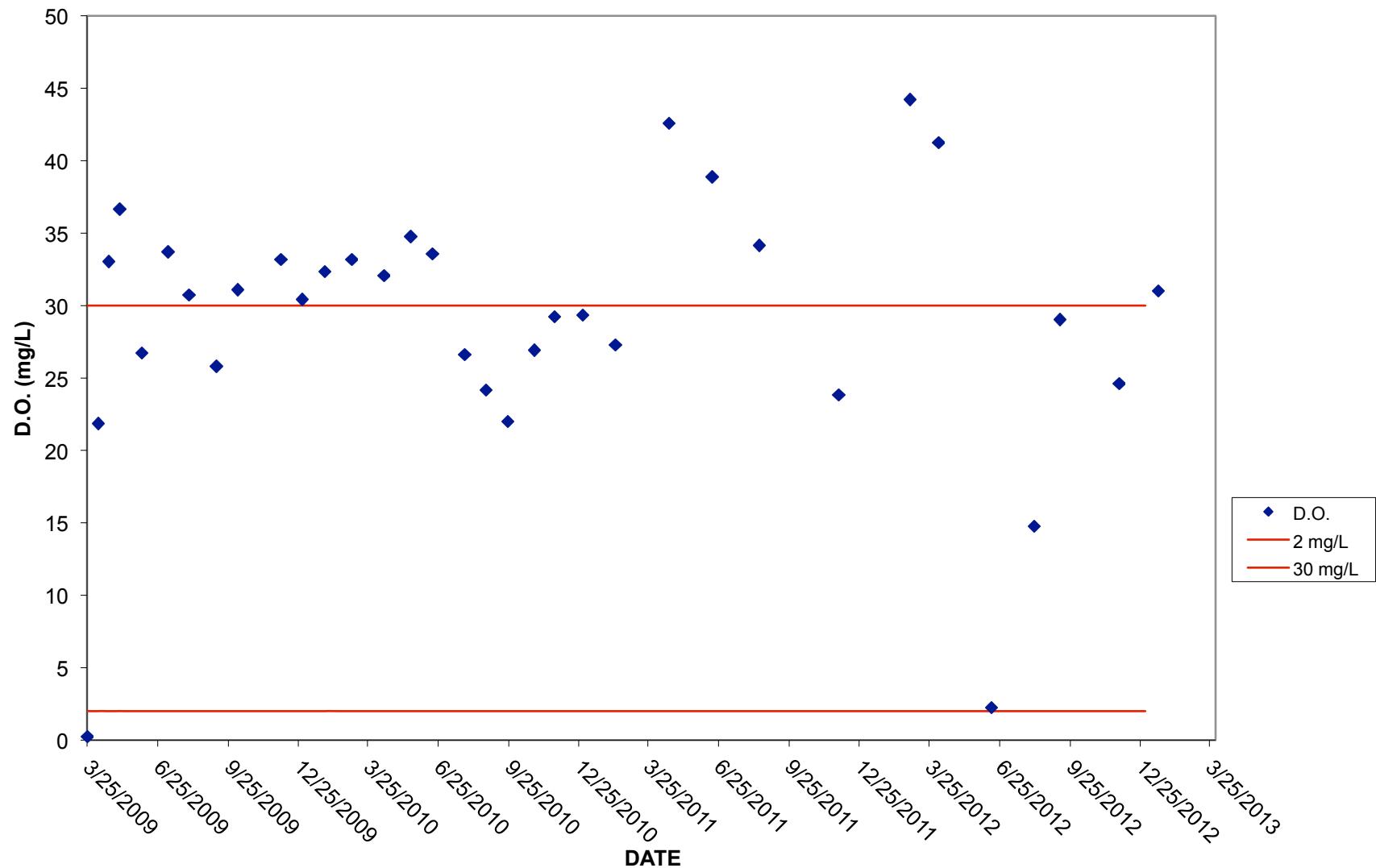
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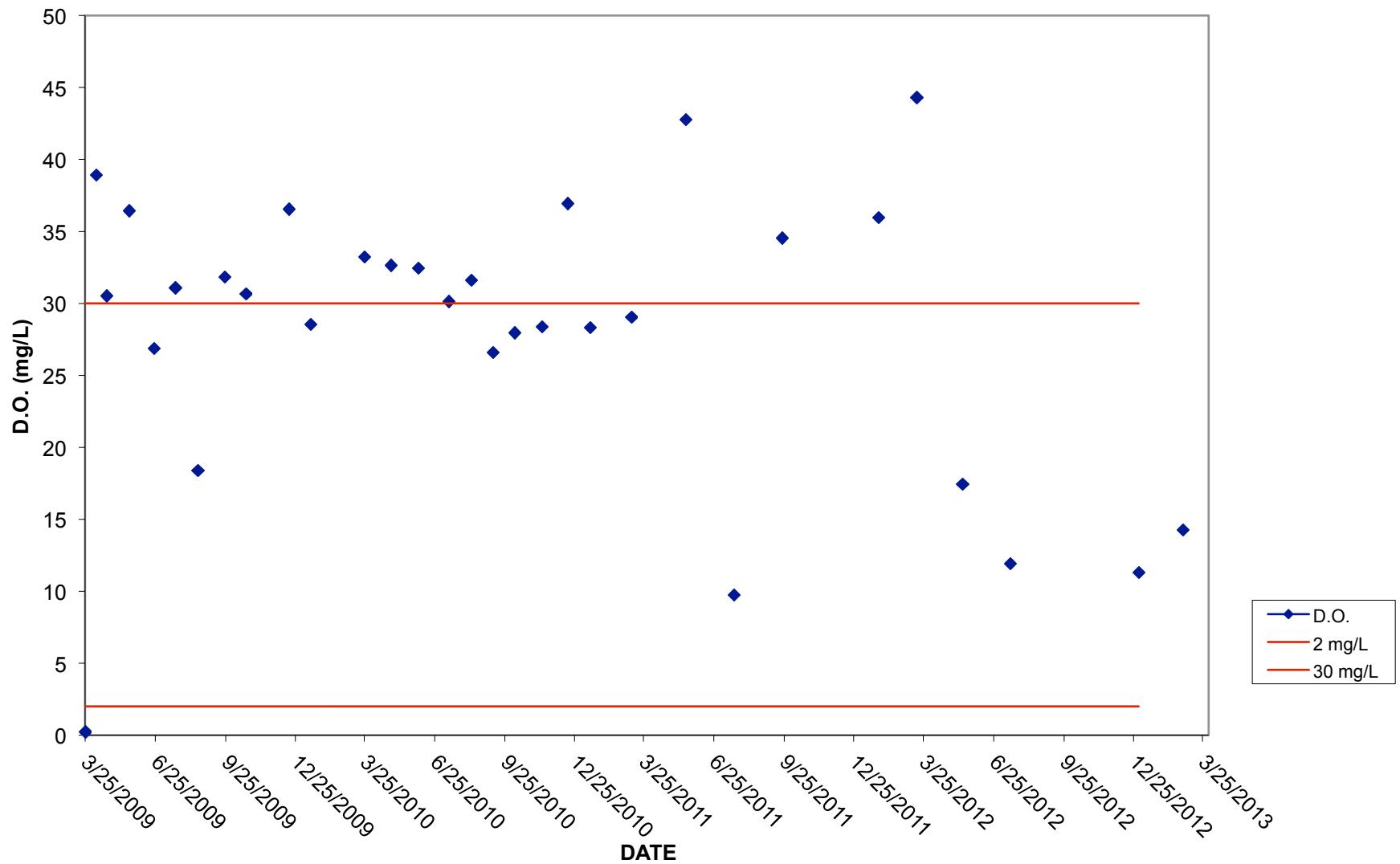
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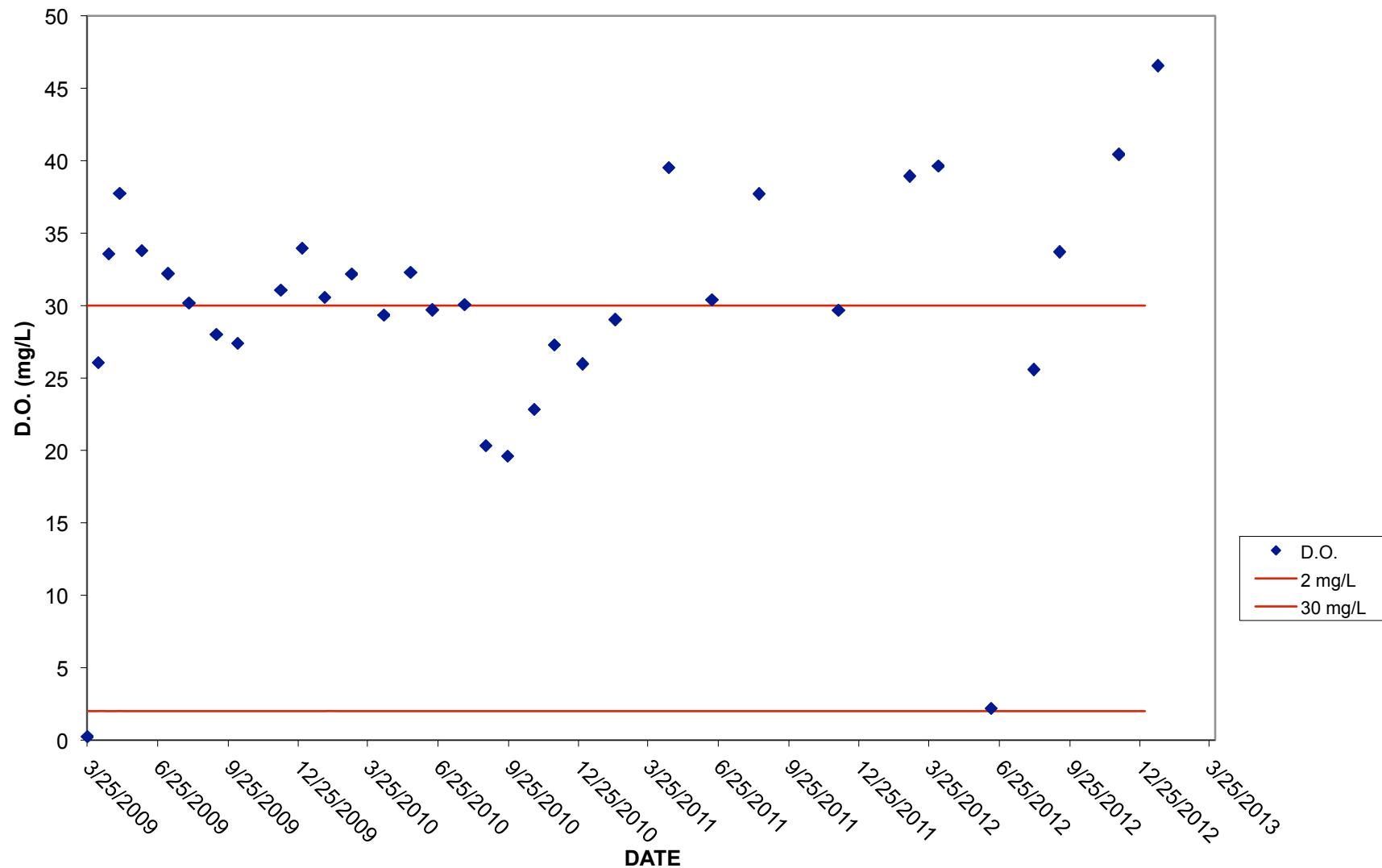
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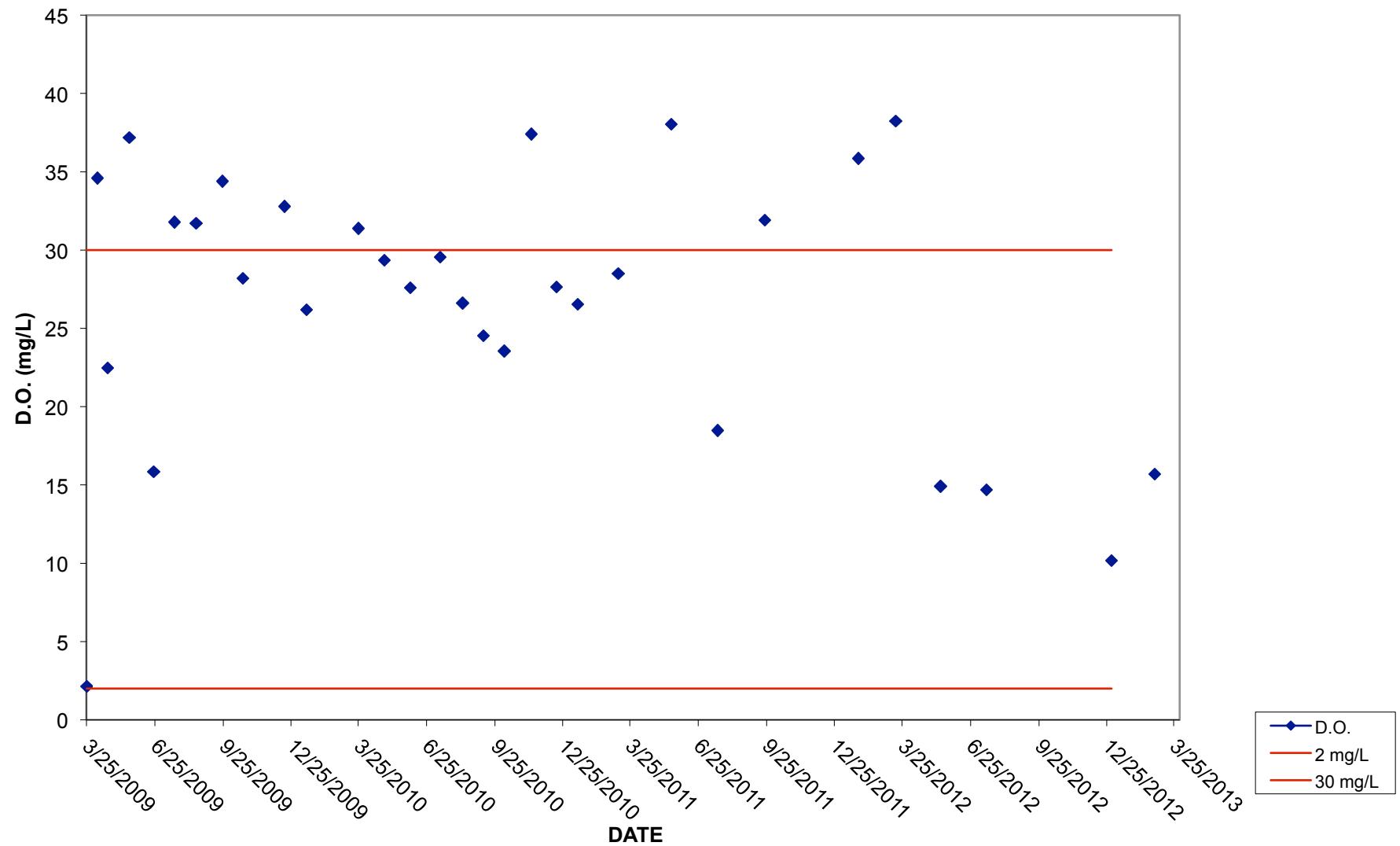
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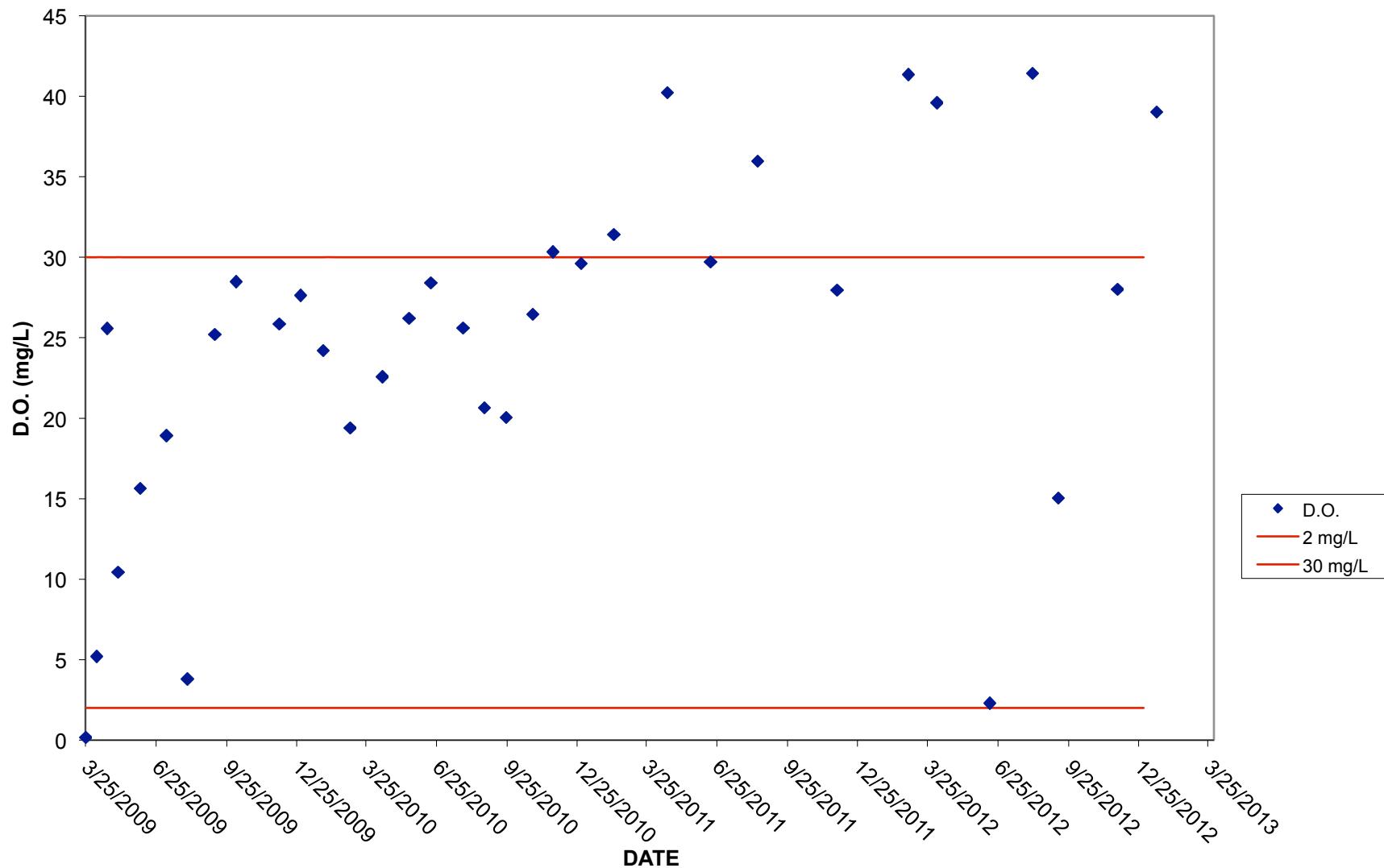
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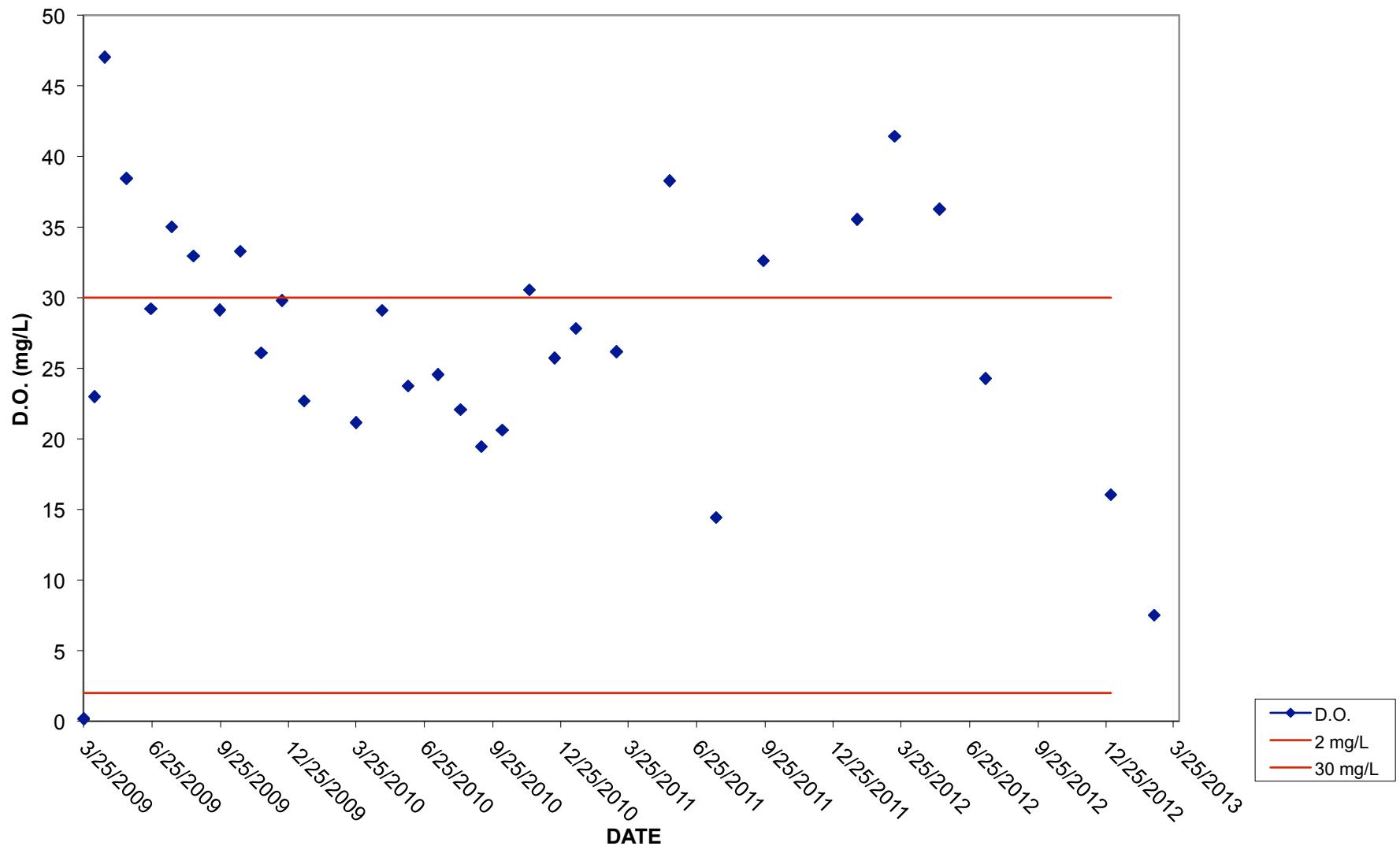
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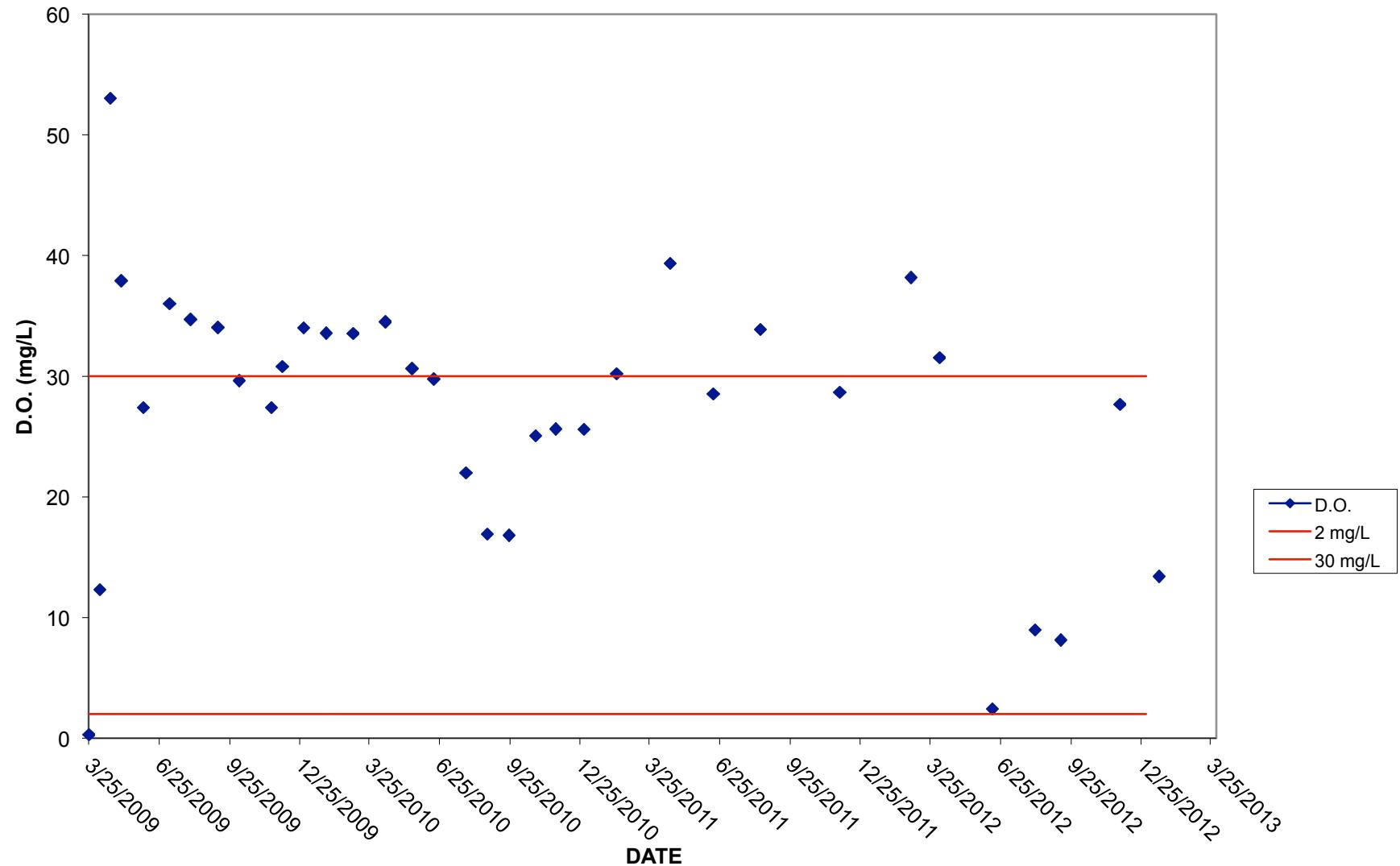
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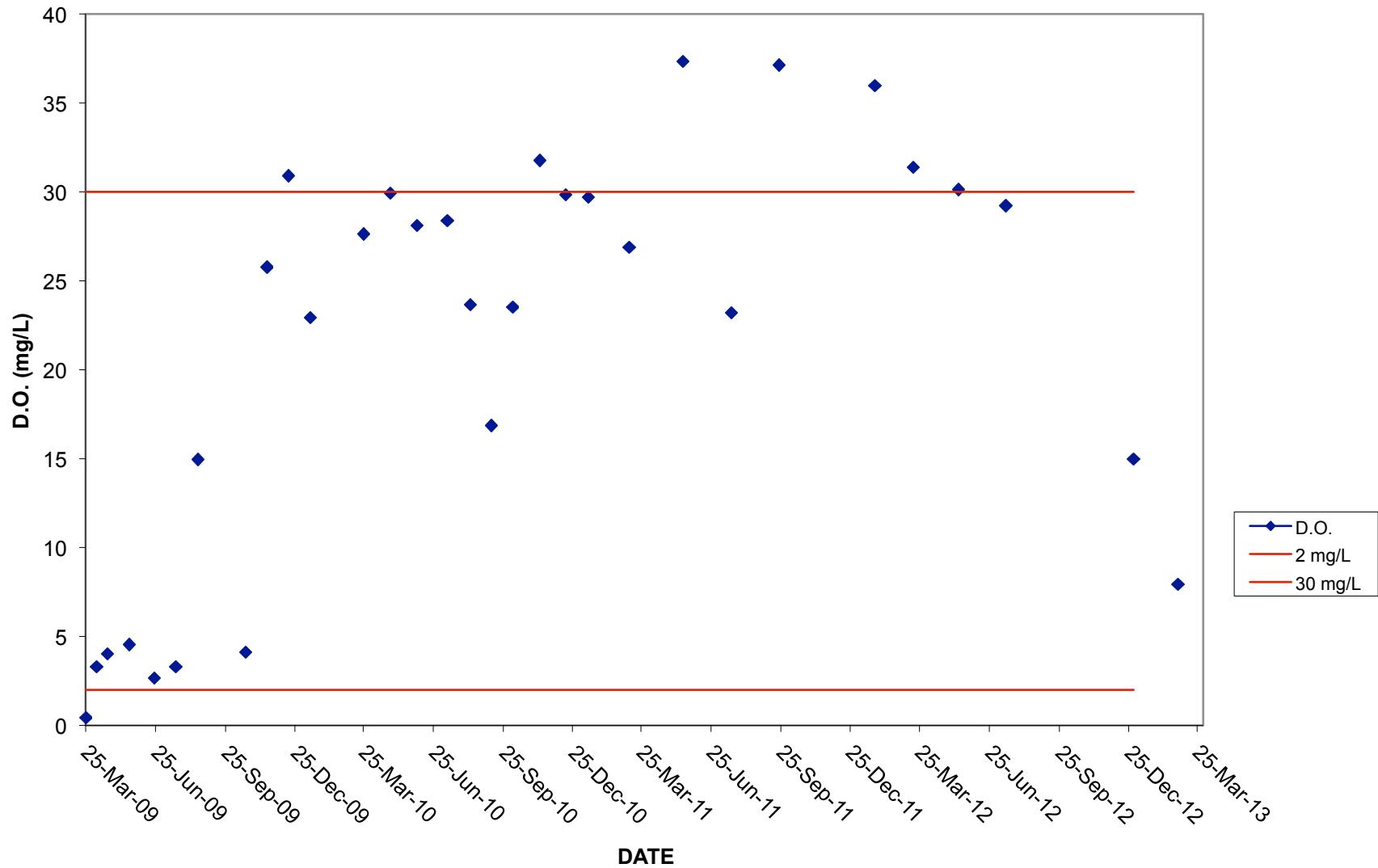
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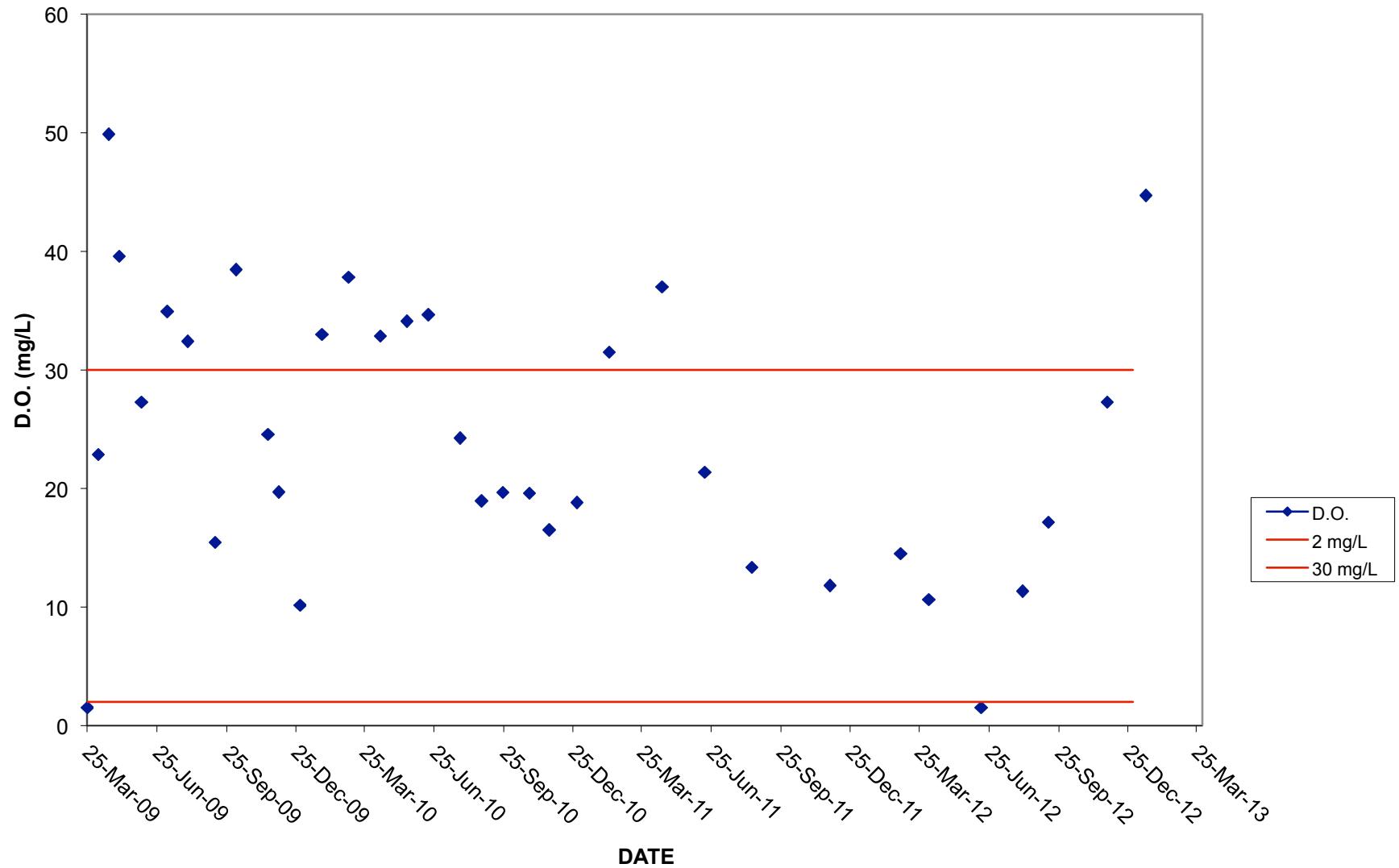
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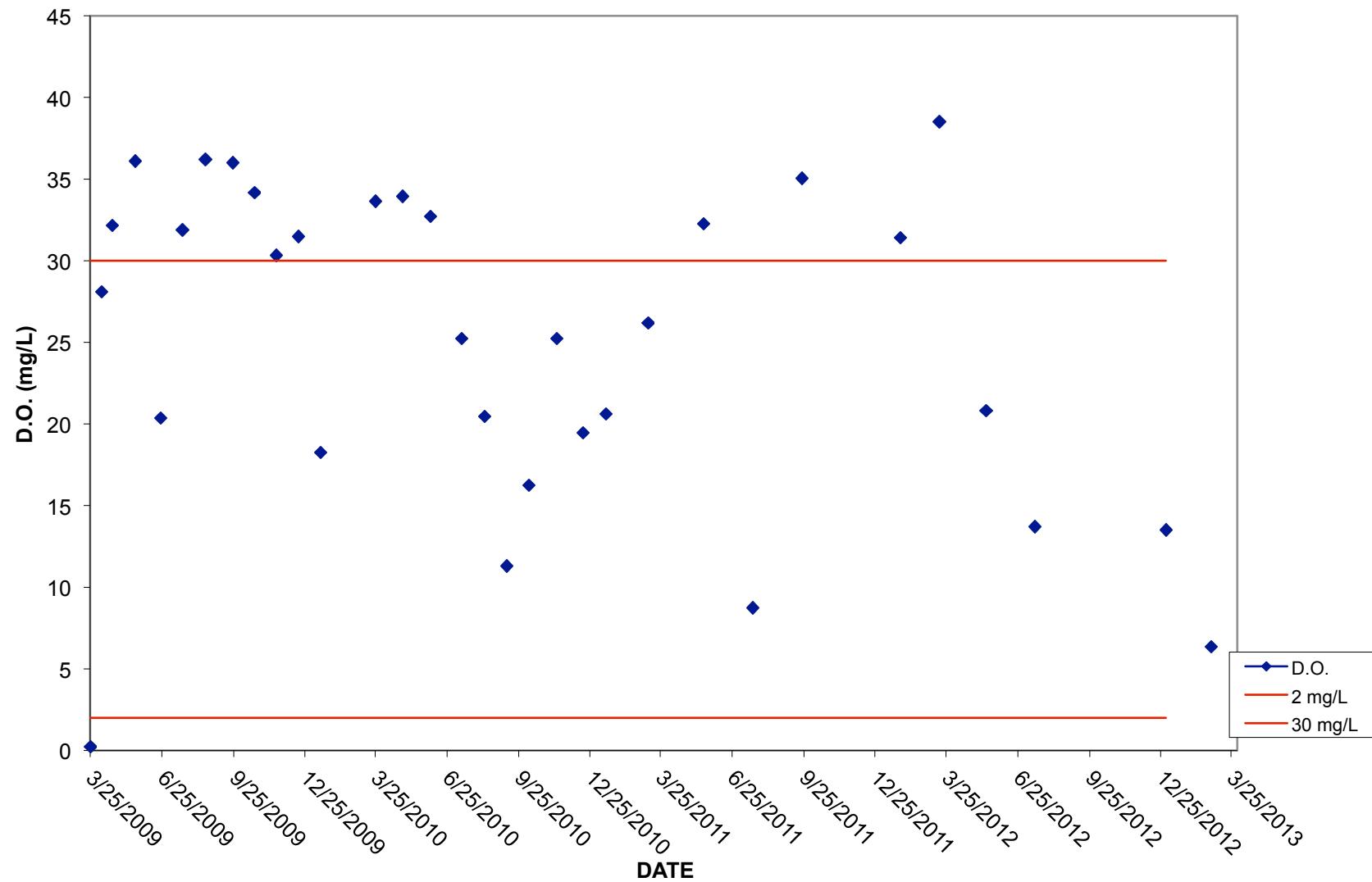
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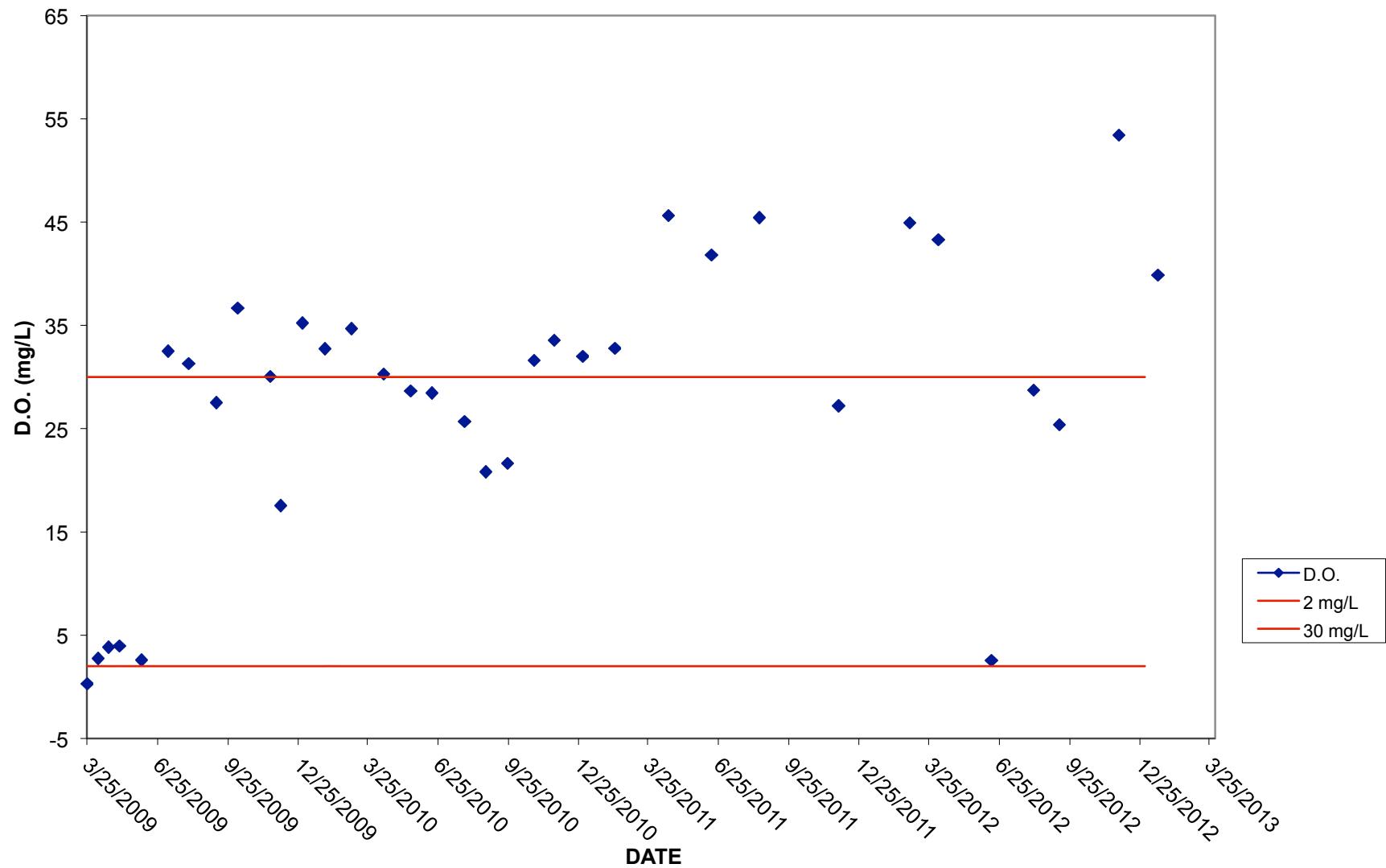
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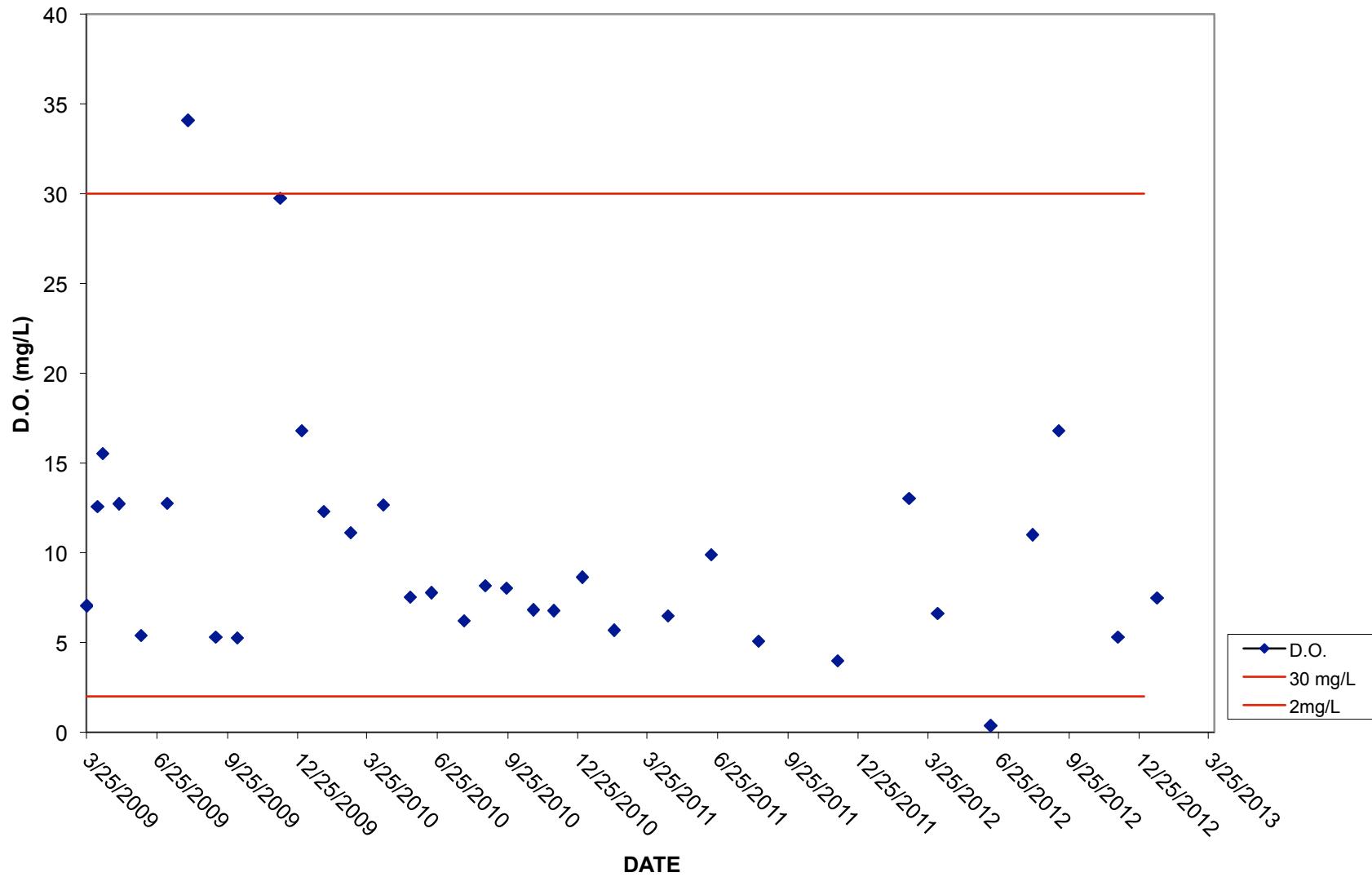
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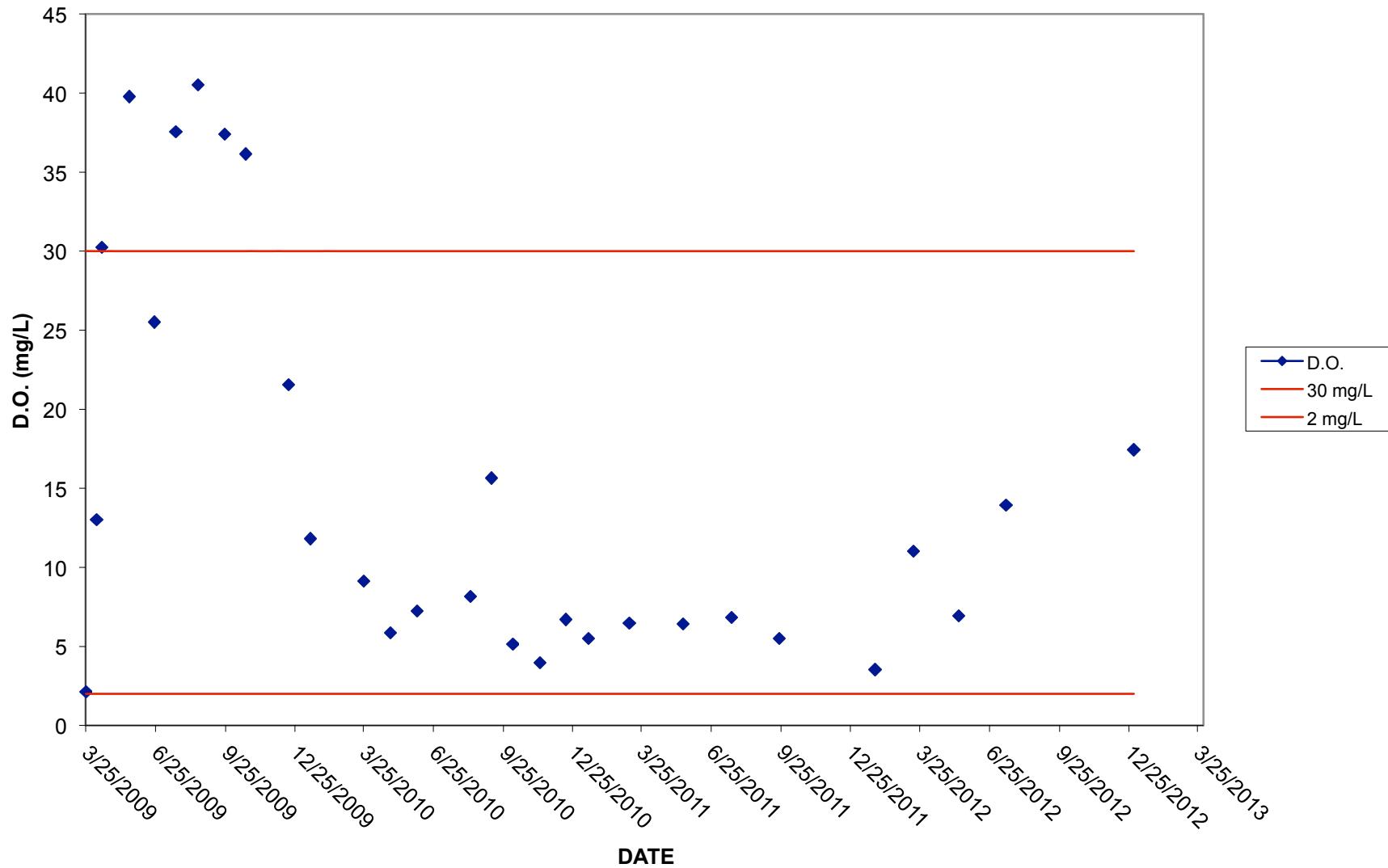
IW-27S D.O. FIELD DATA vs TIME



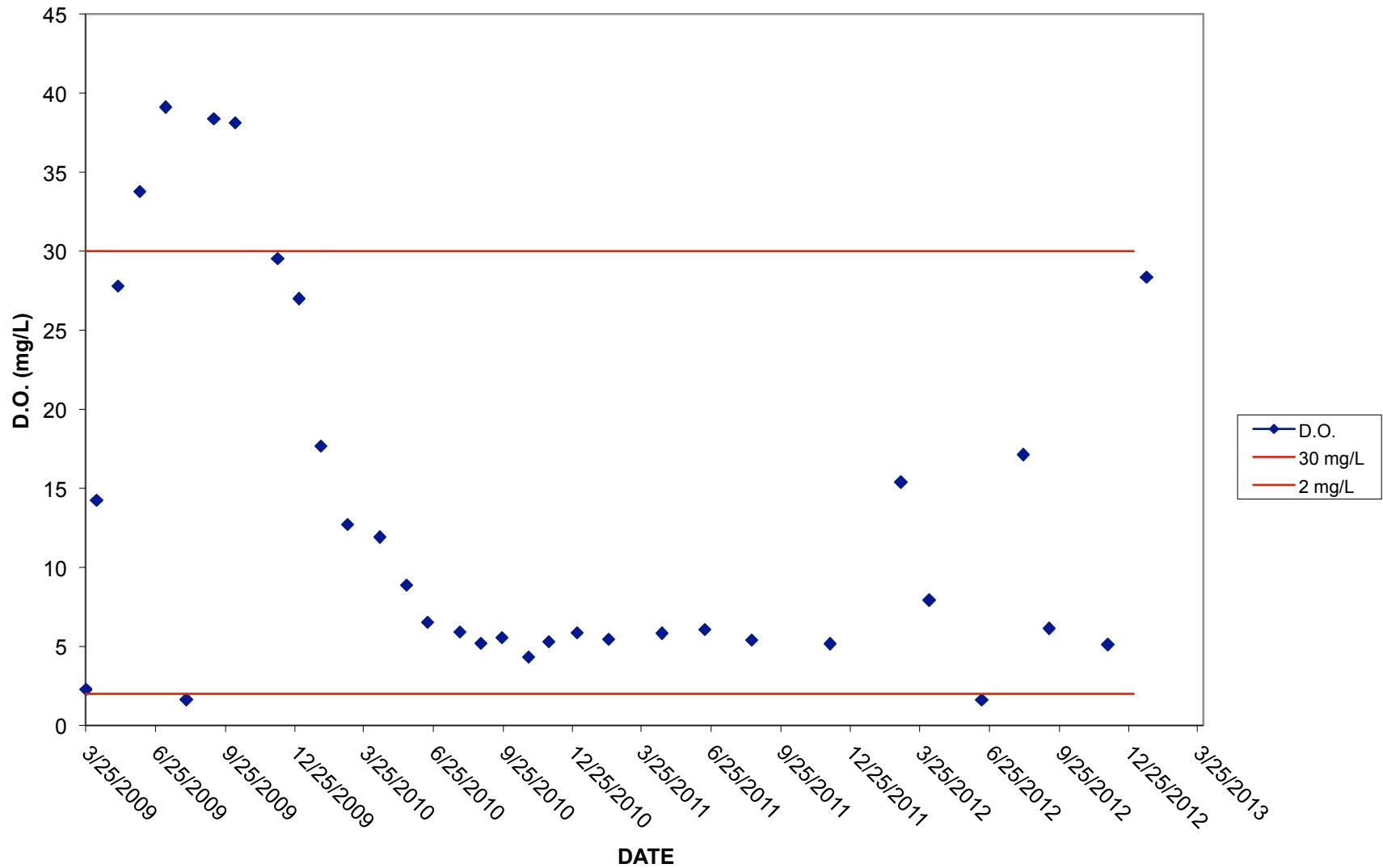
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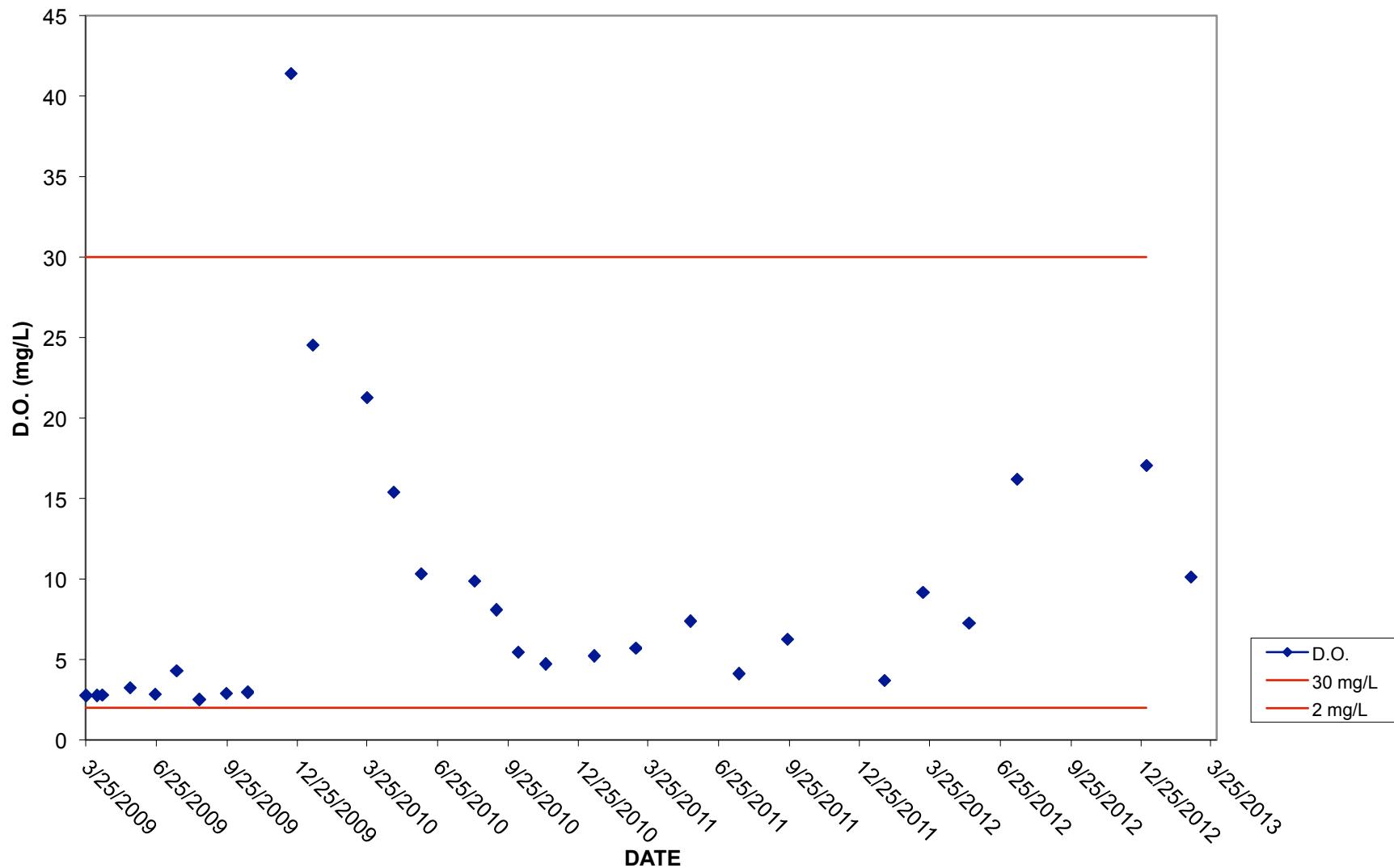
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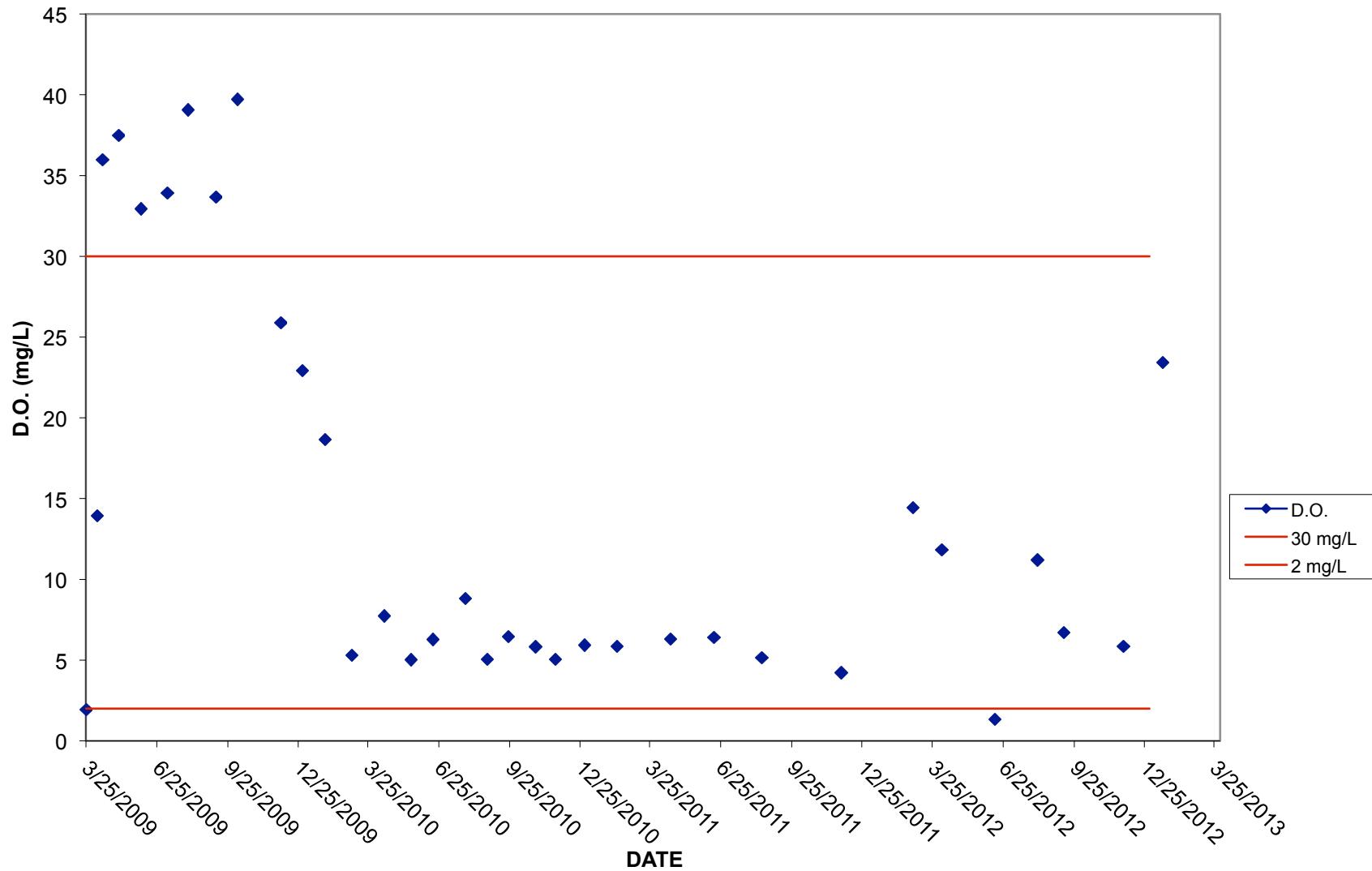
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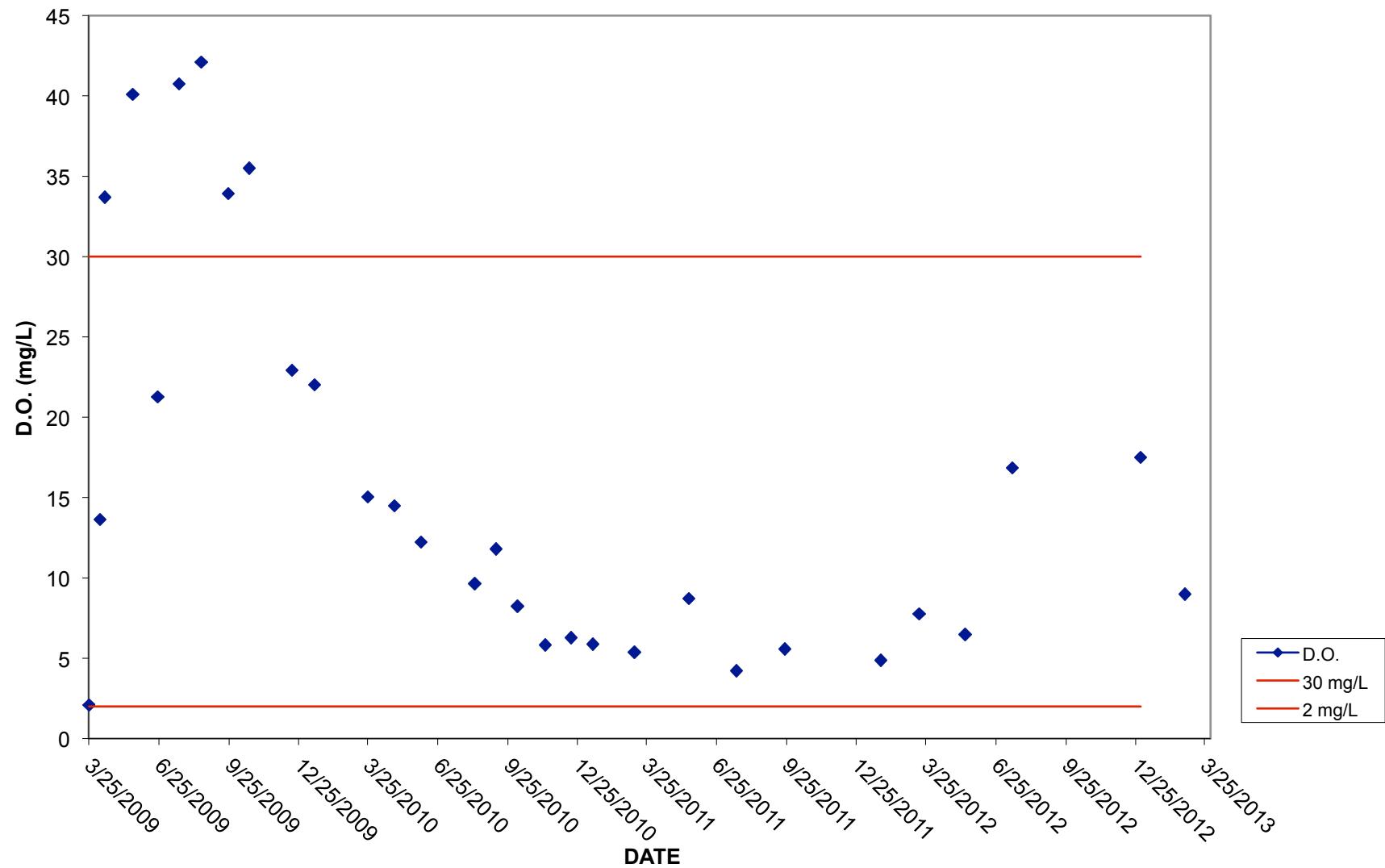
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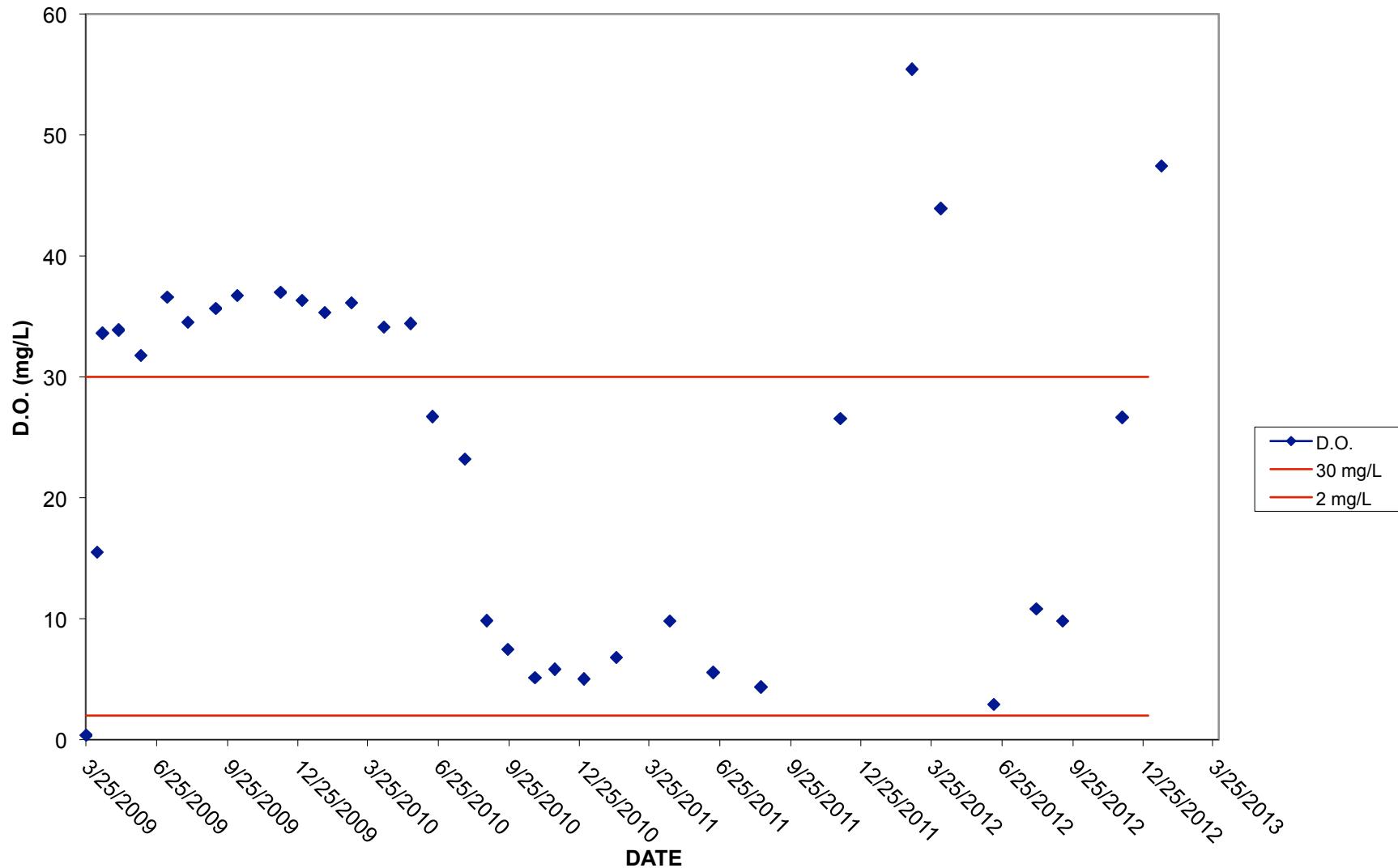
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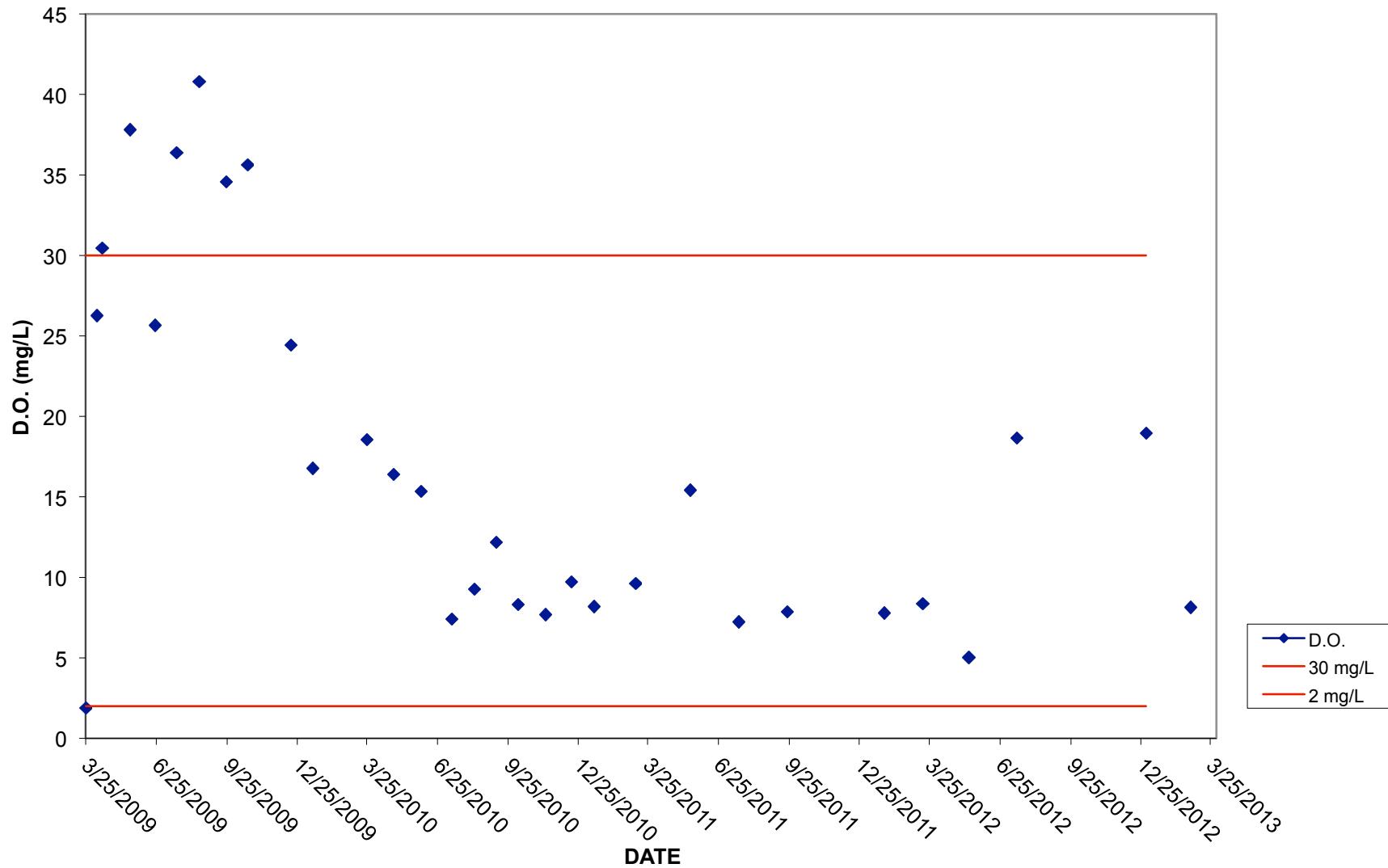
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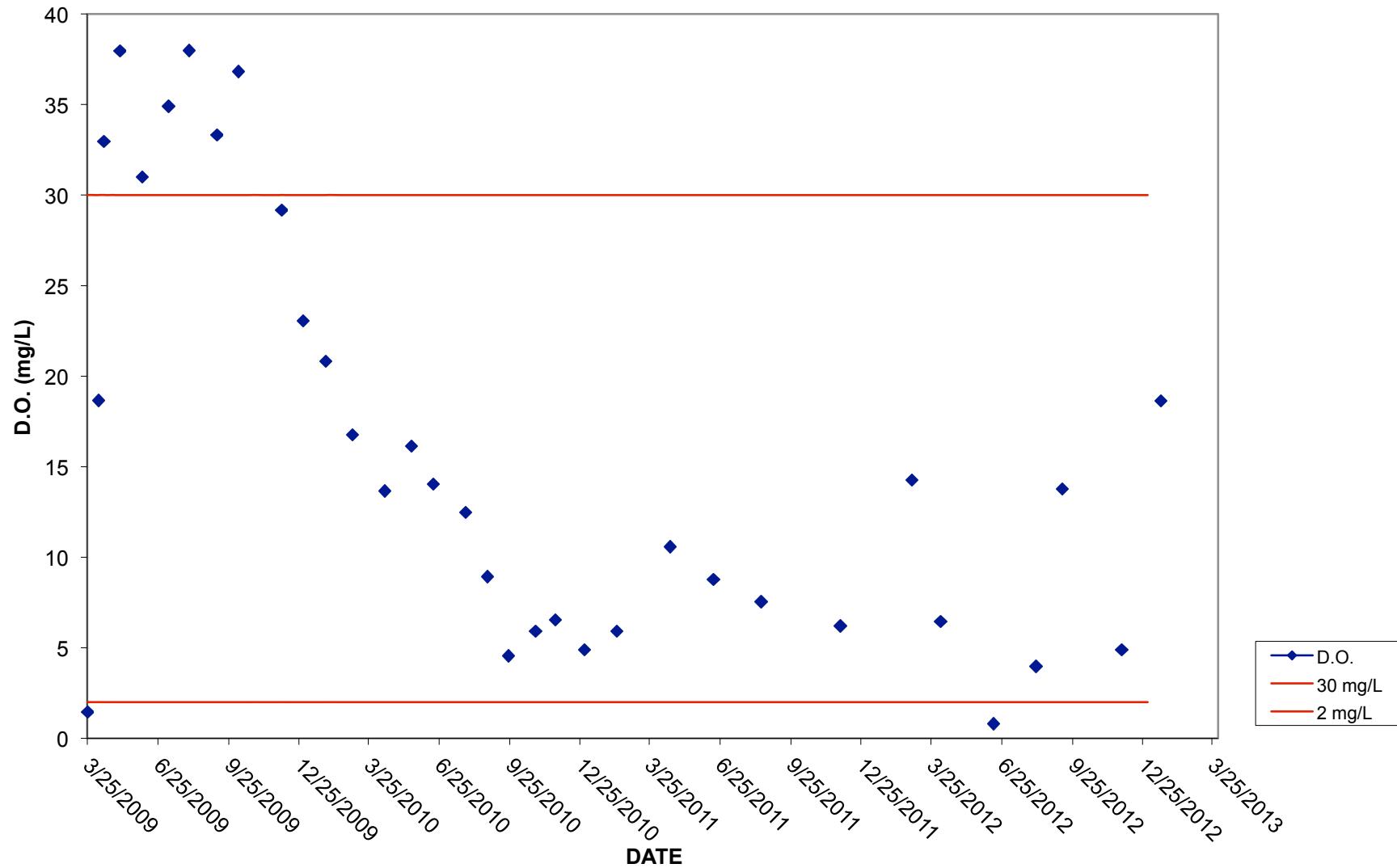
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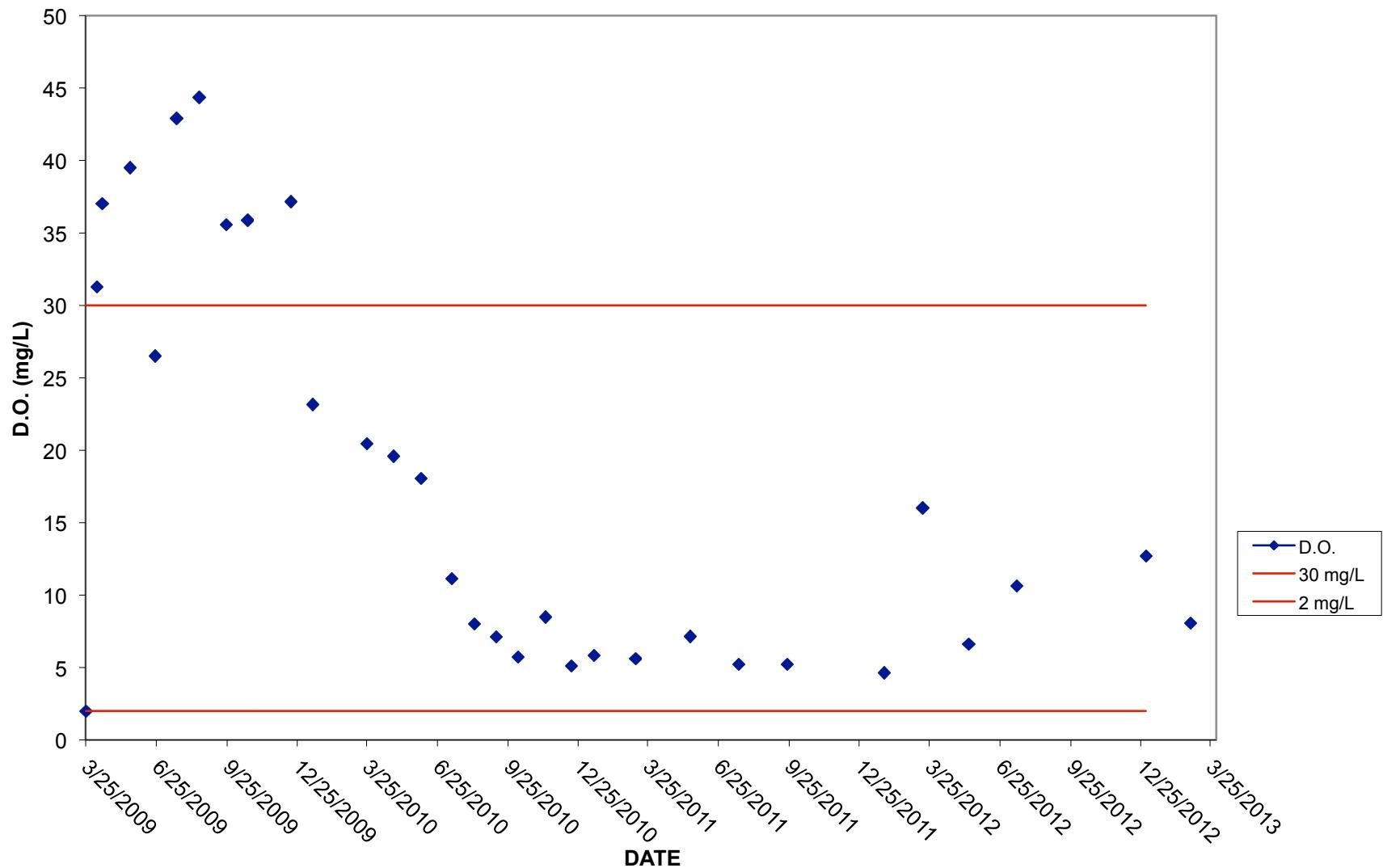
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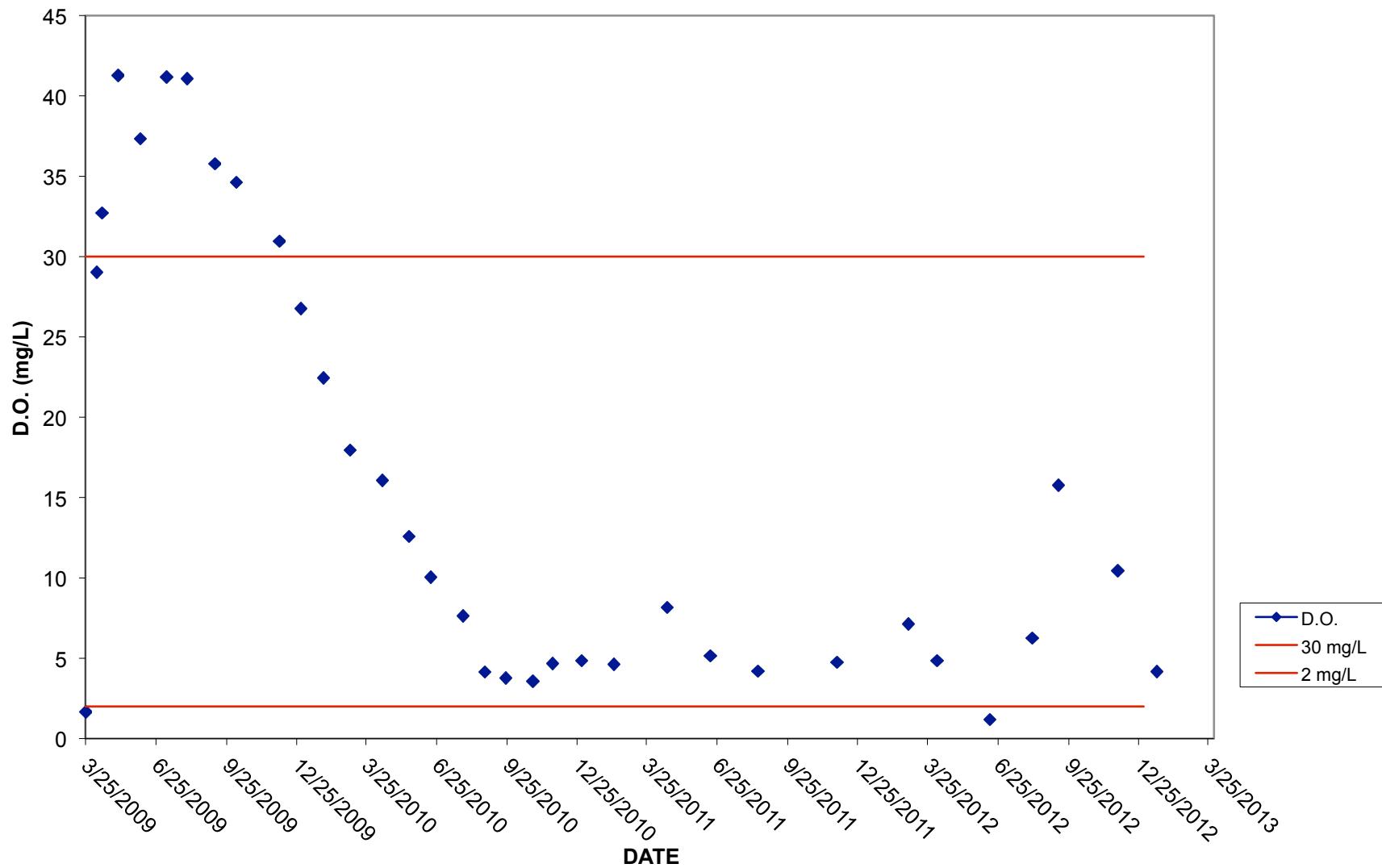
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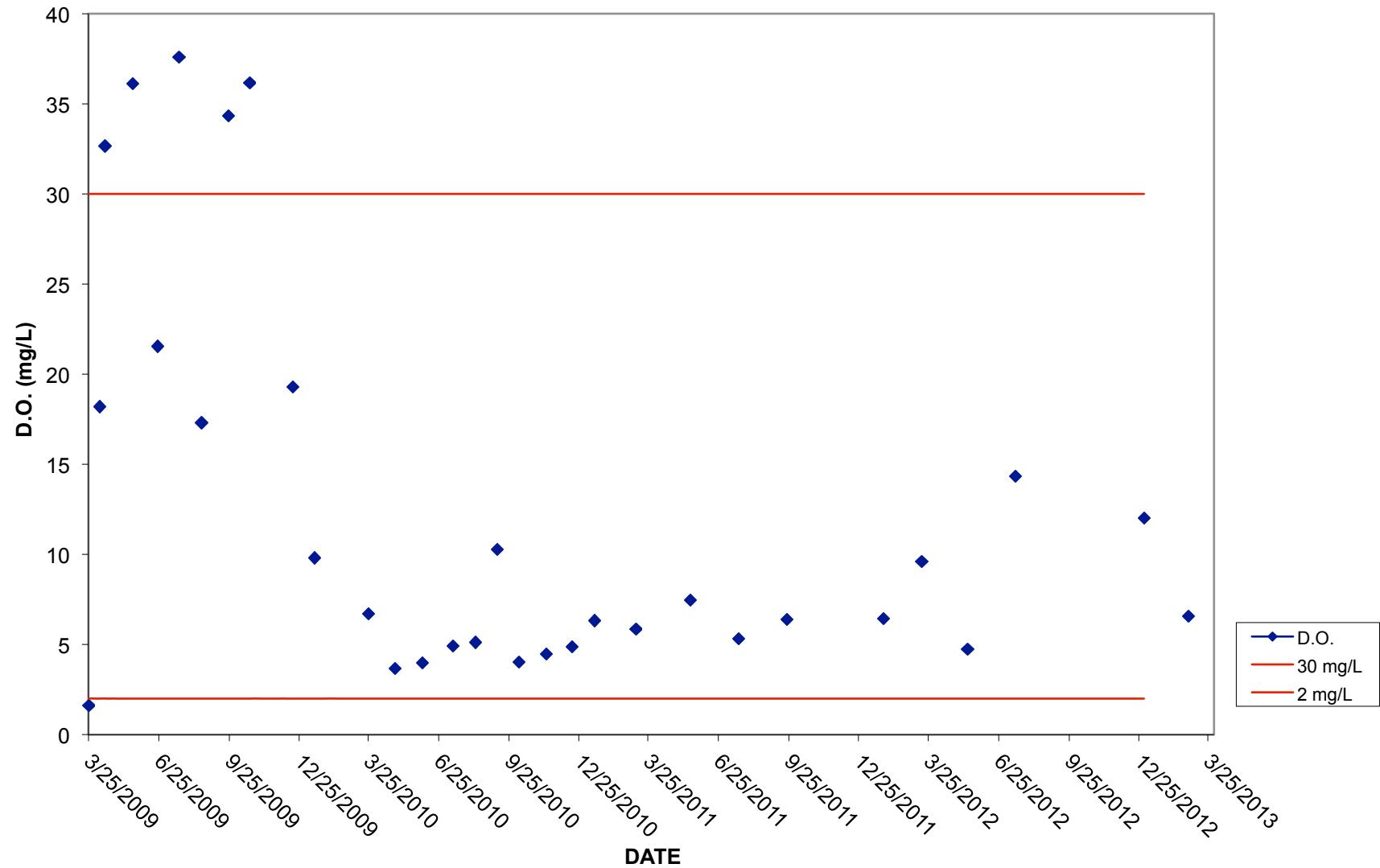
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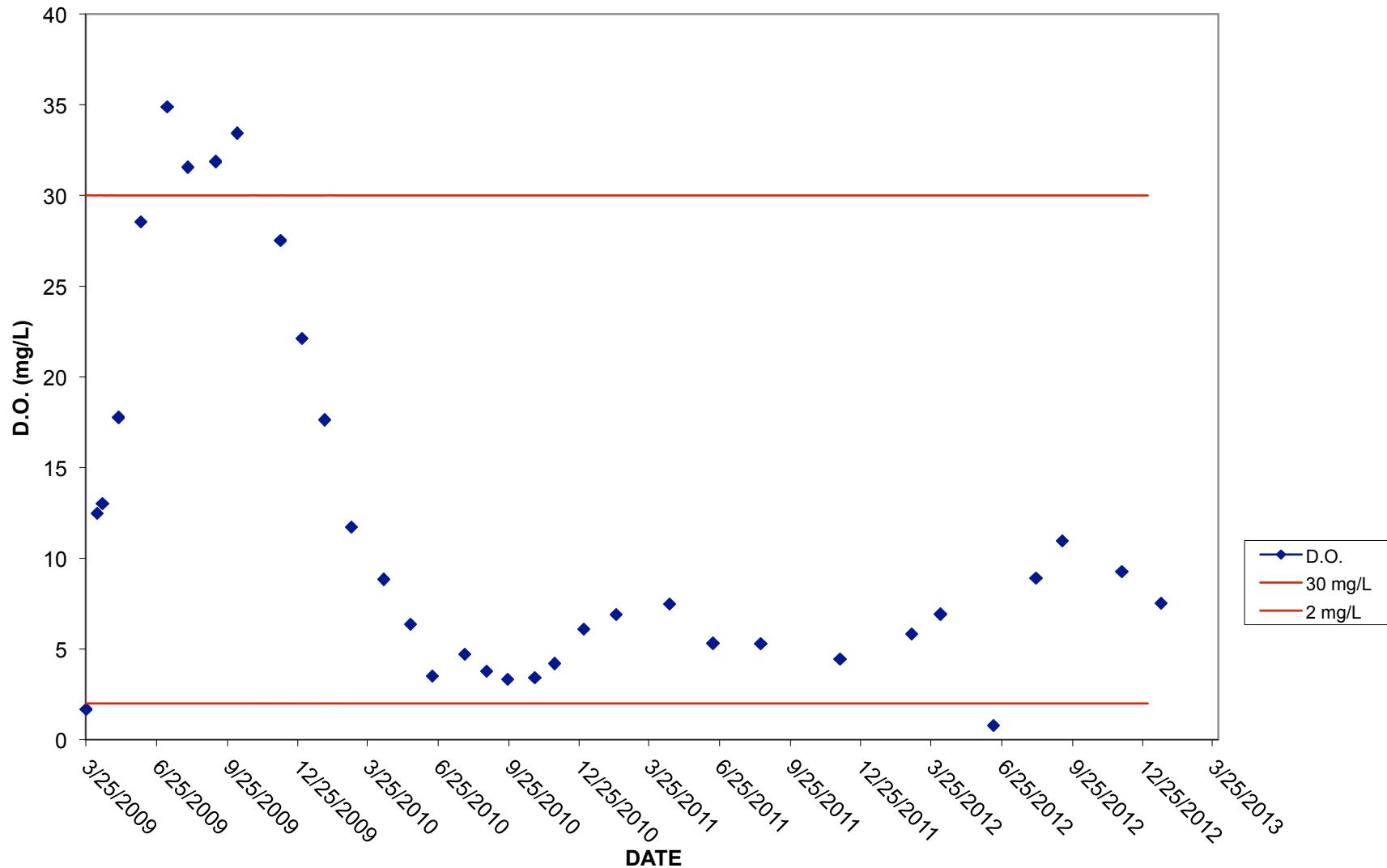
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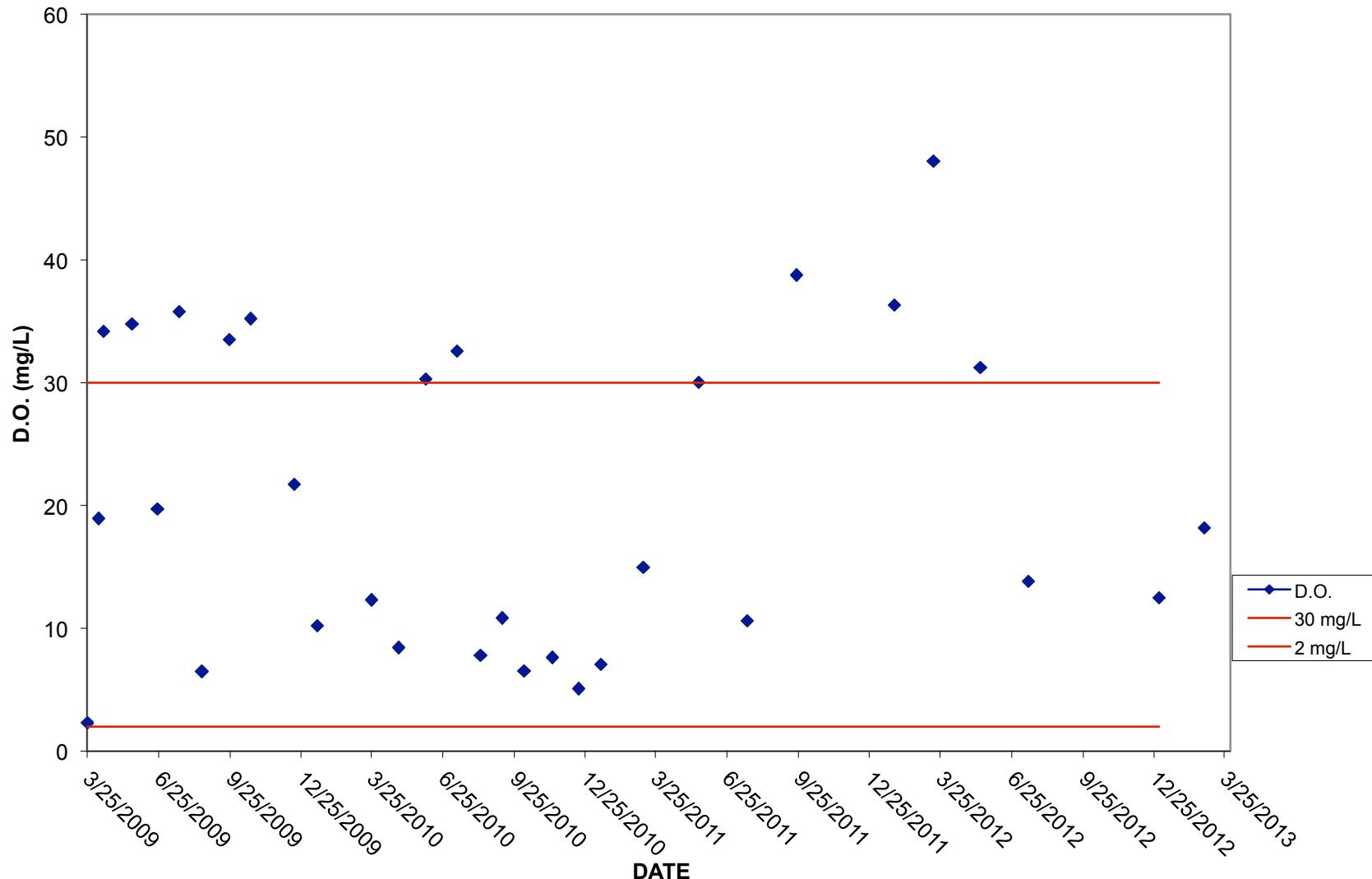
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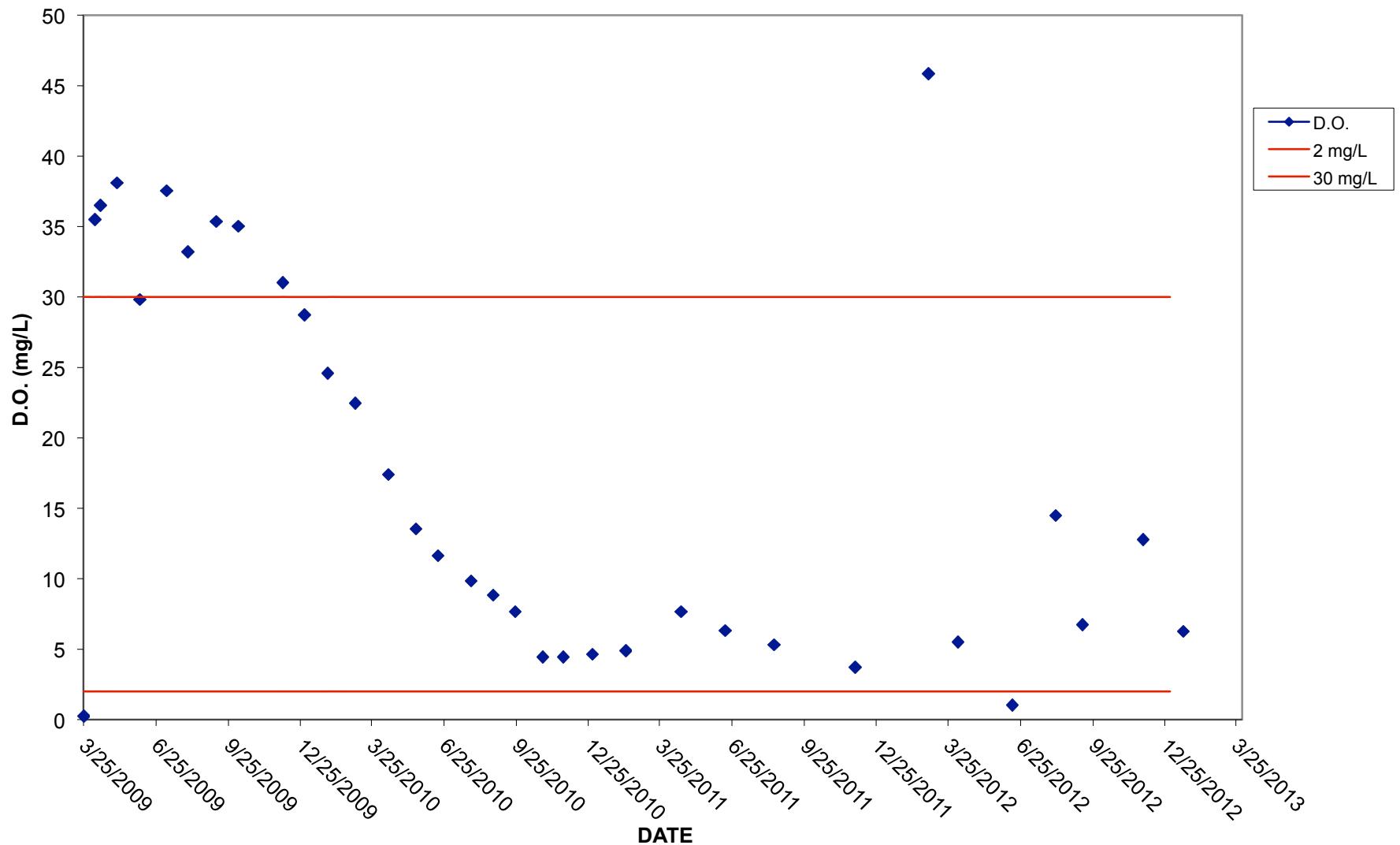
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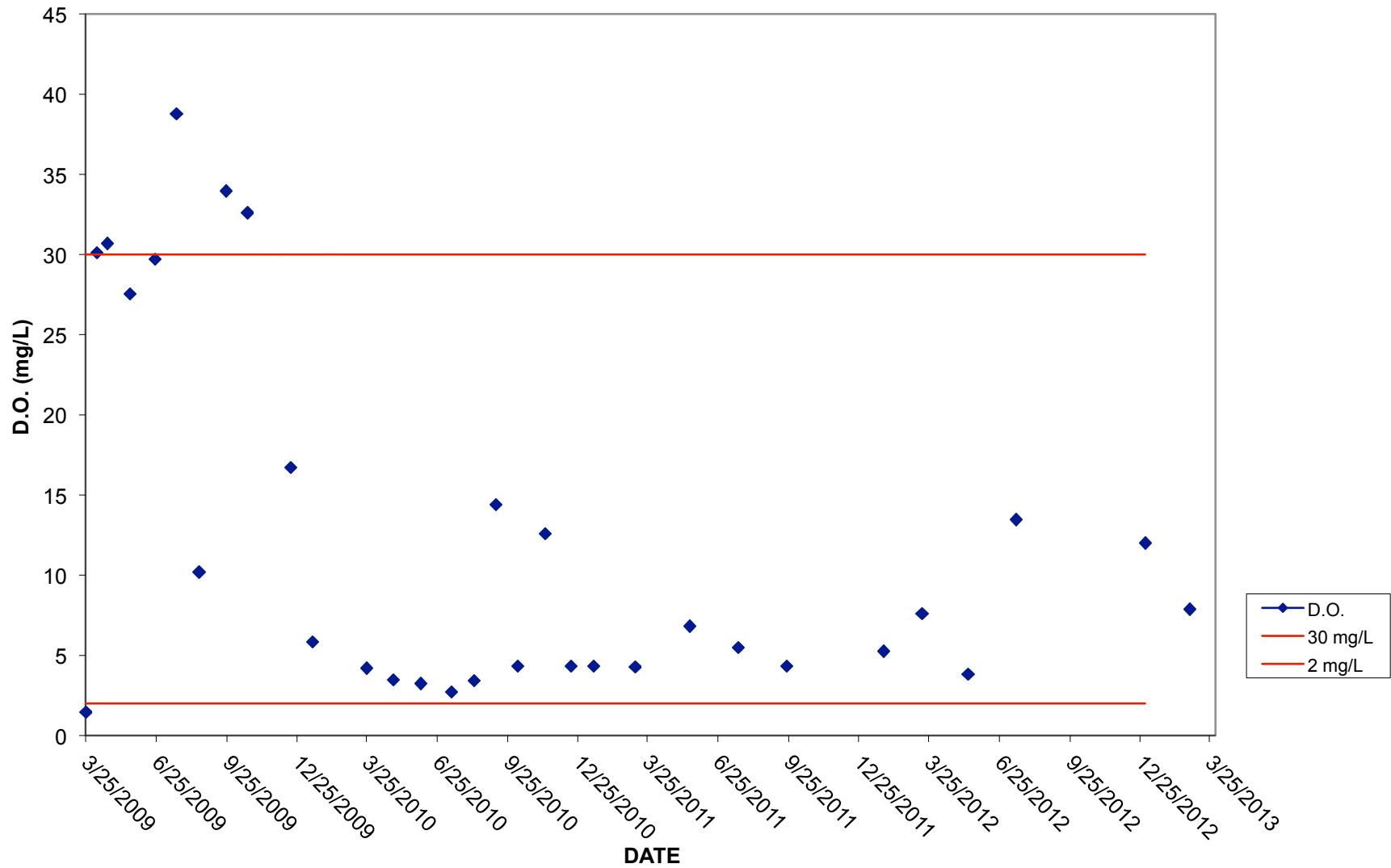
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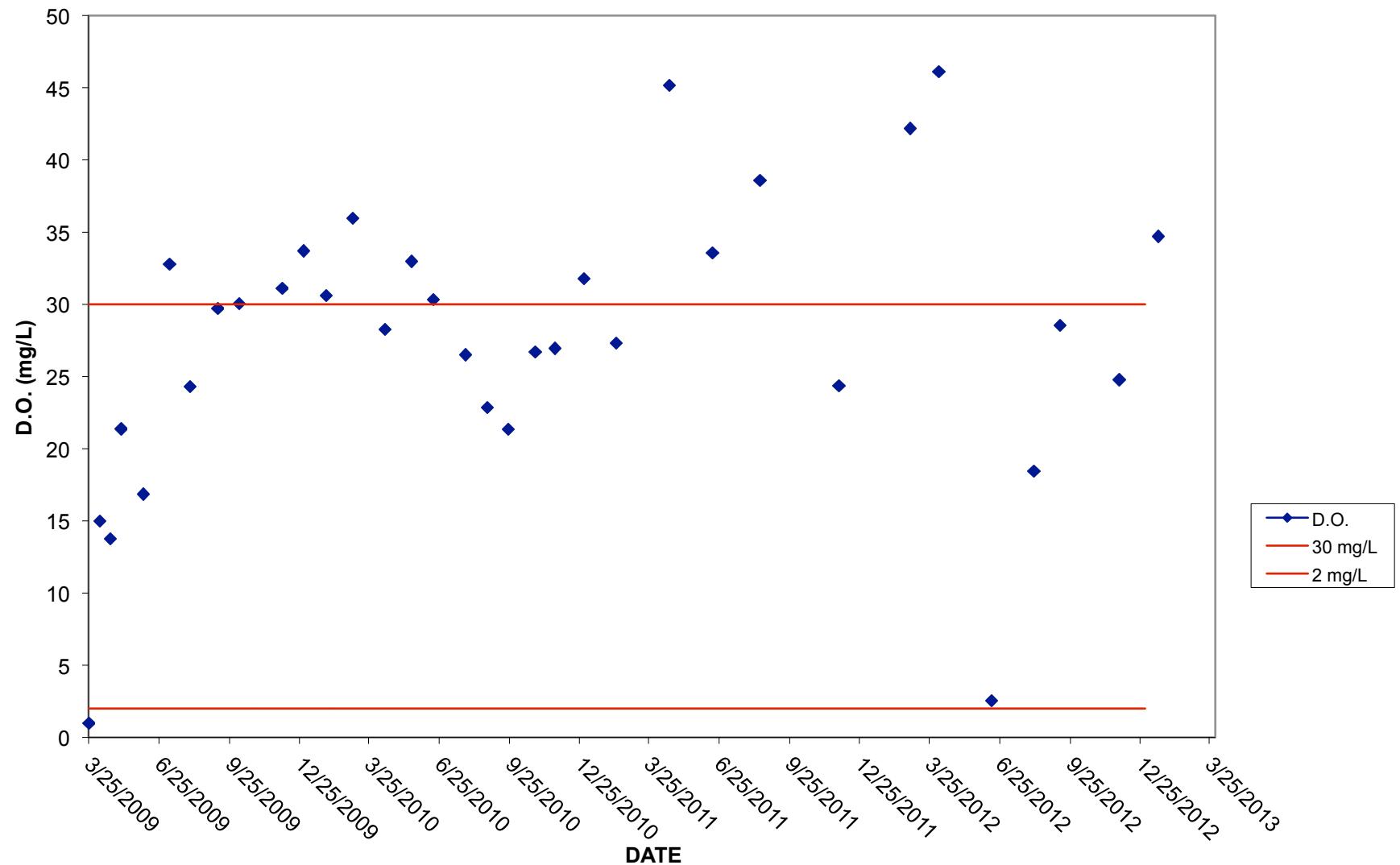
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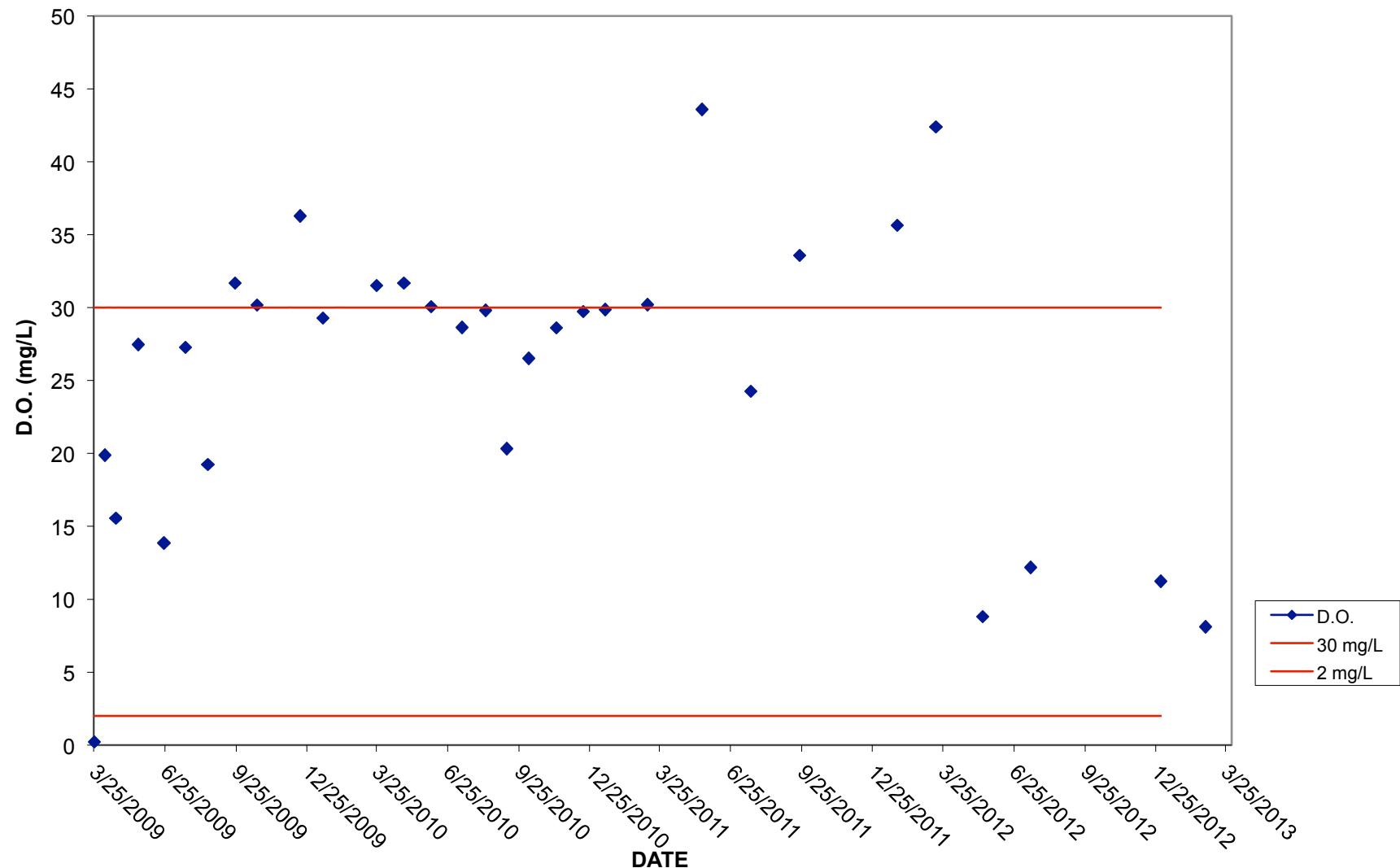
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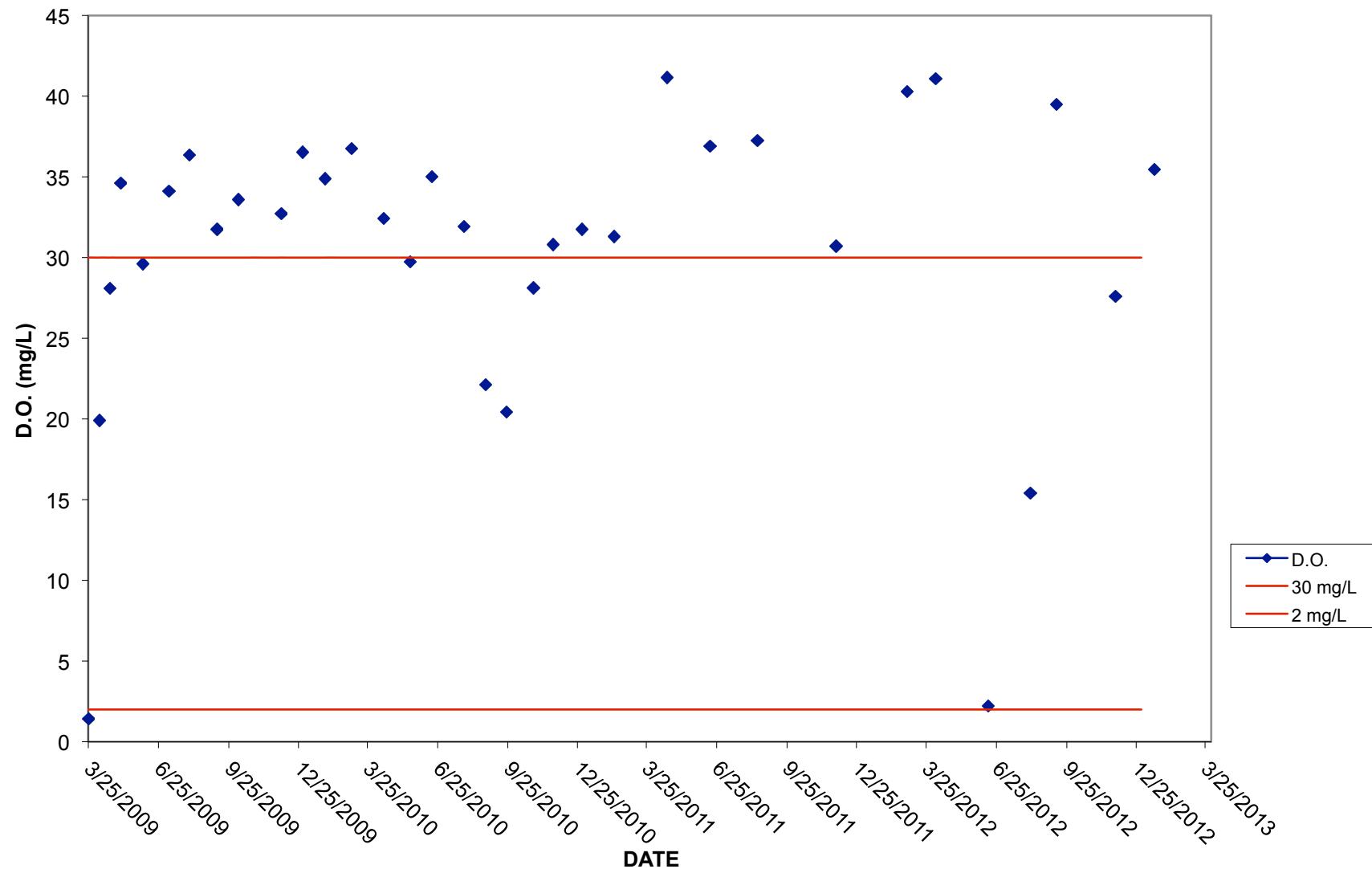
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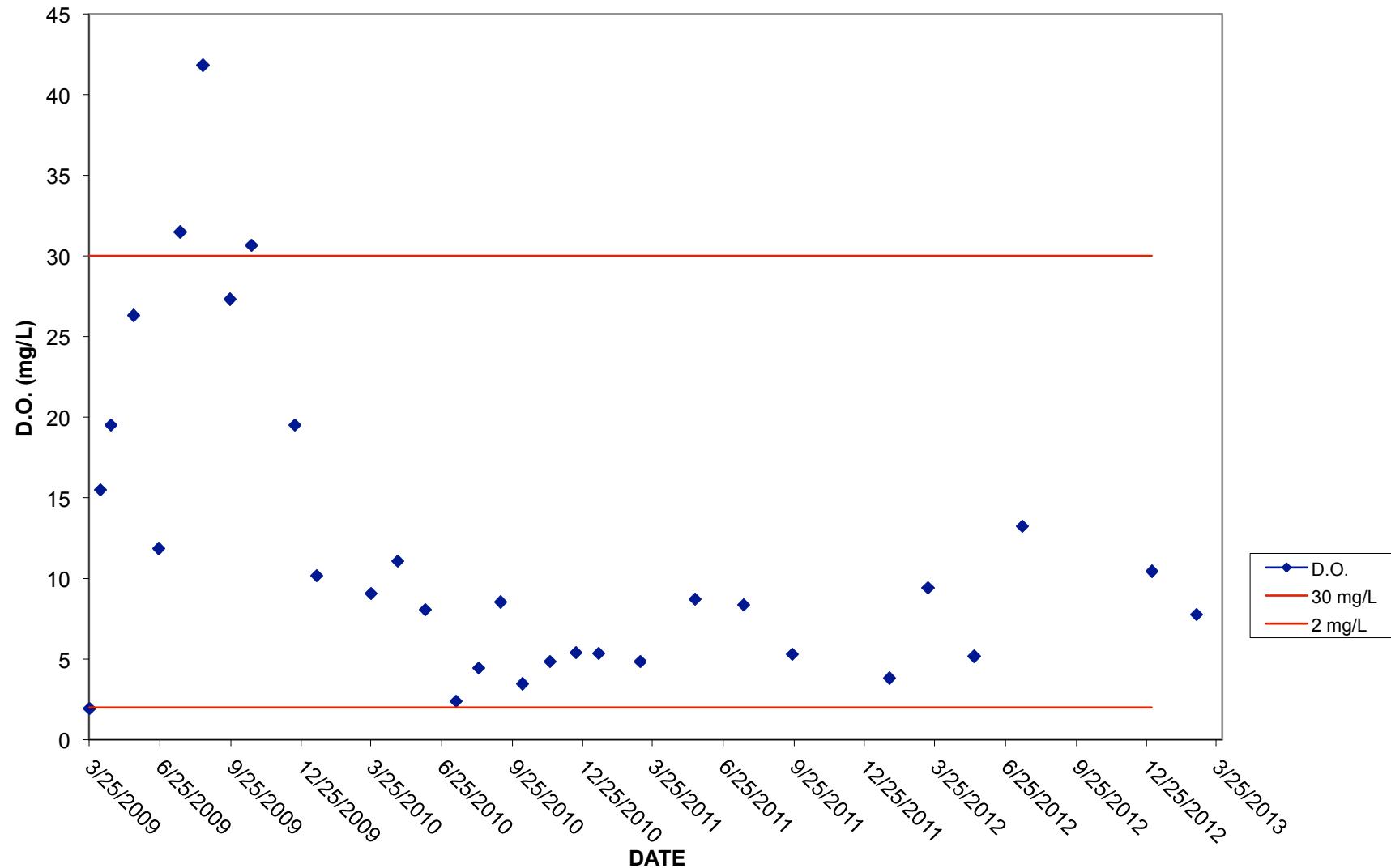
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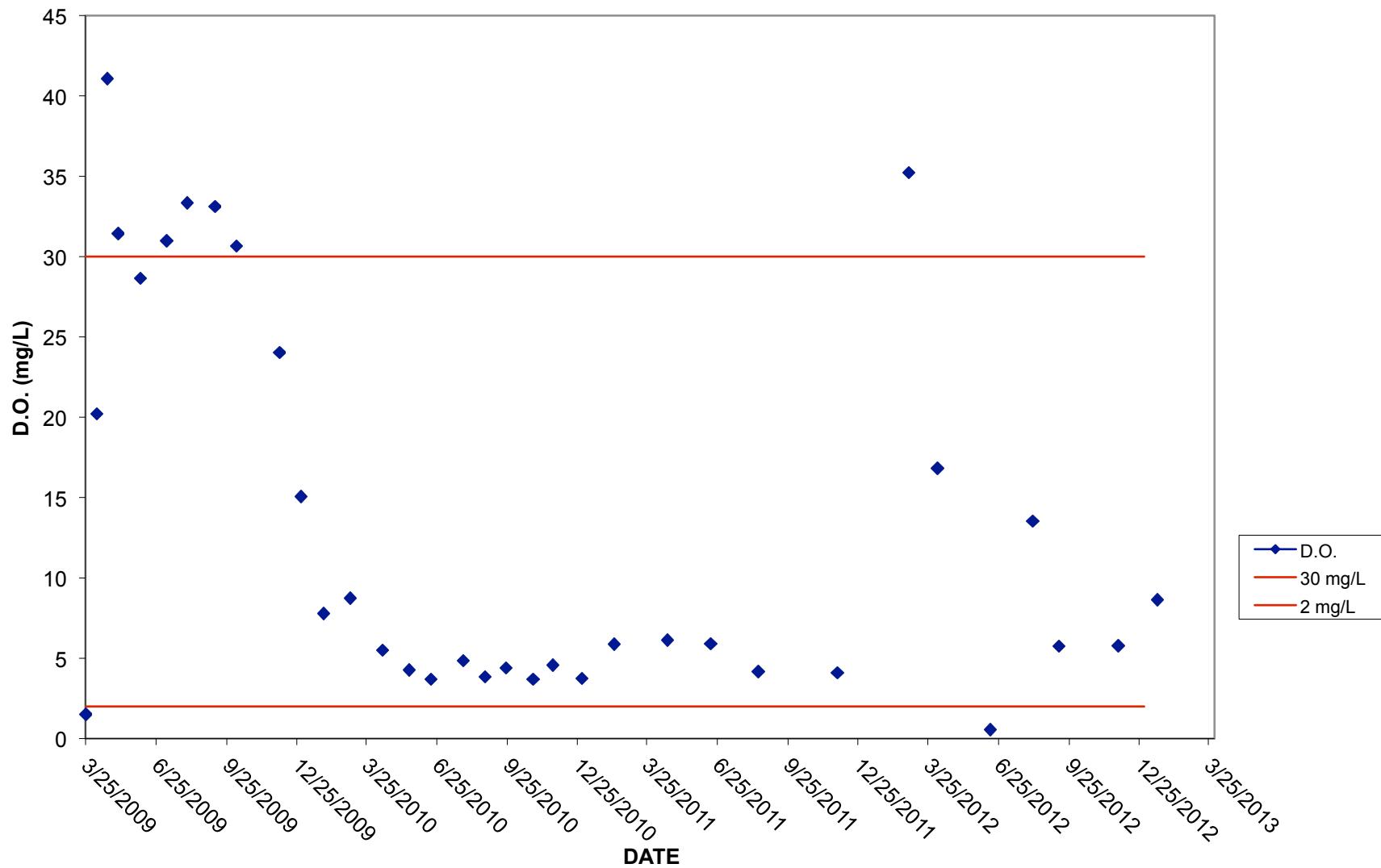
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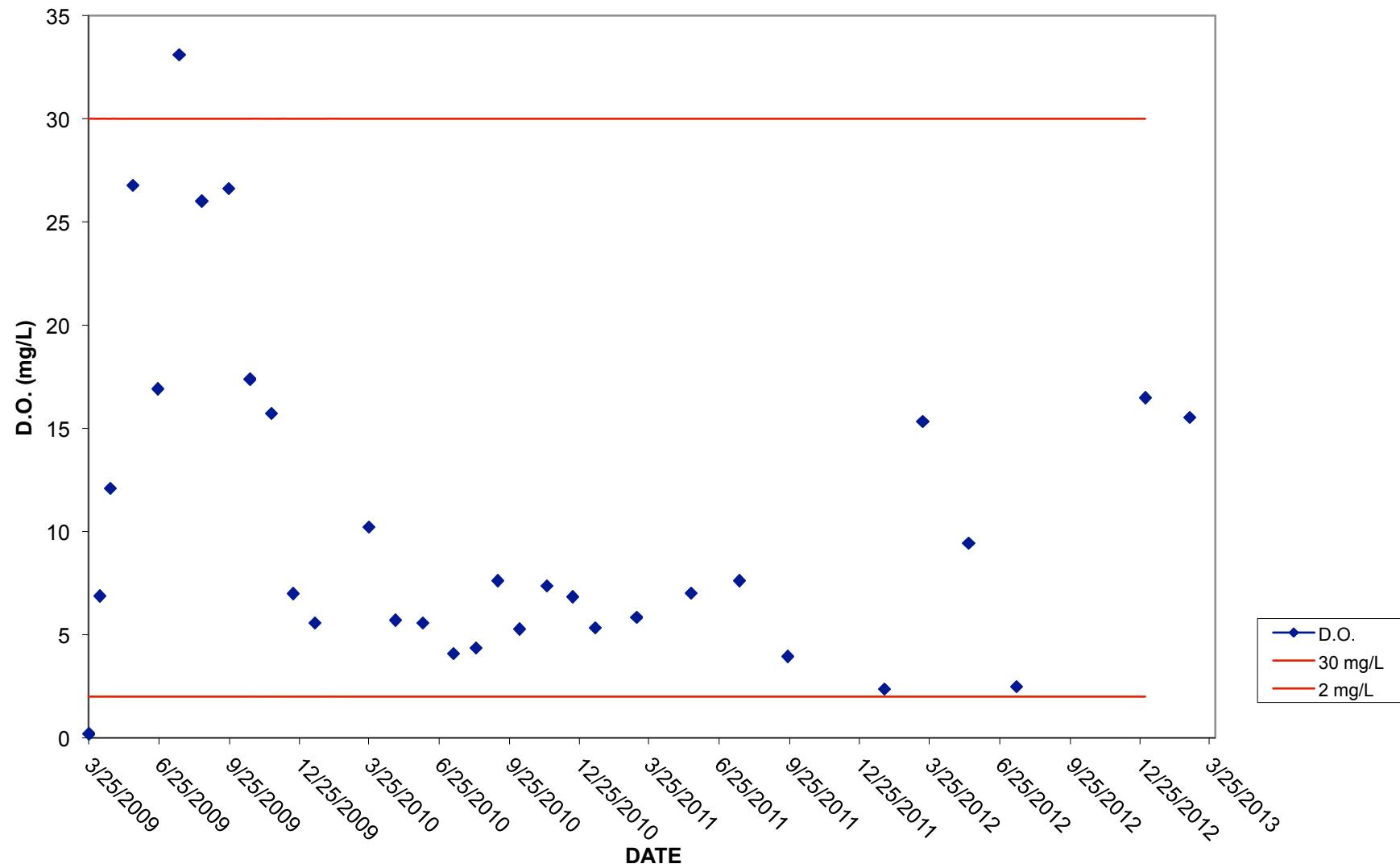
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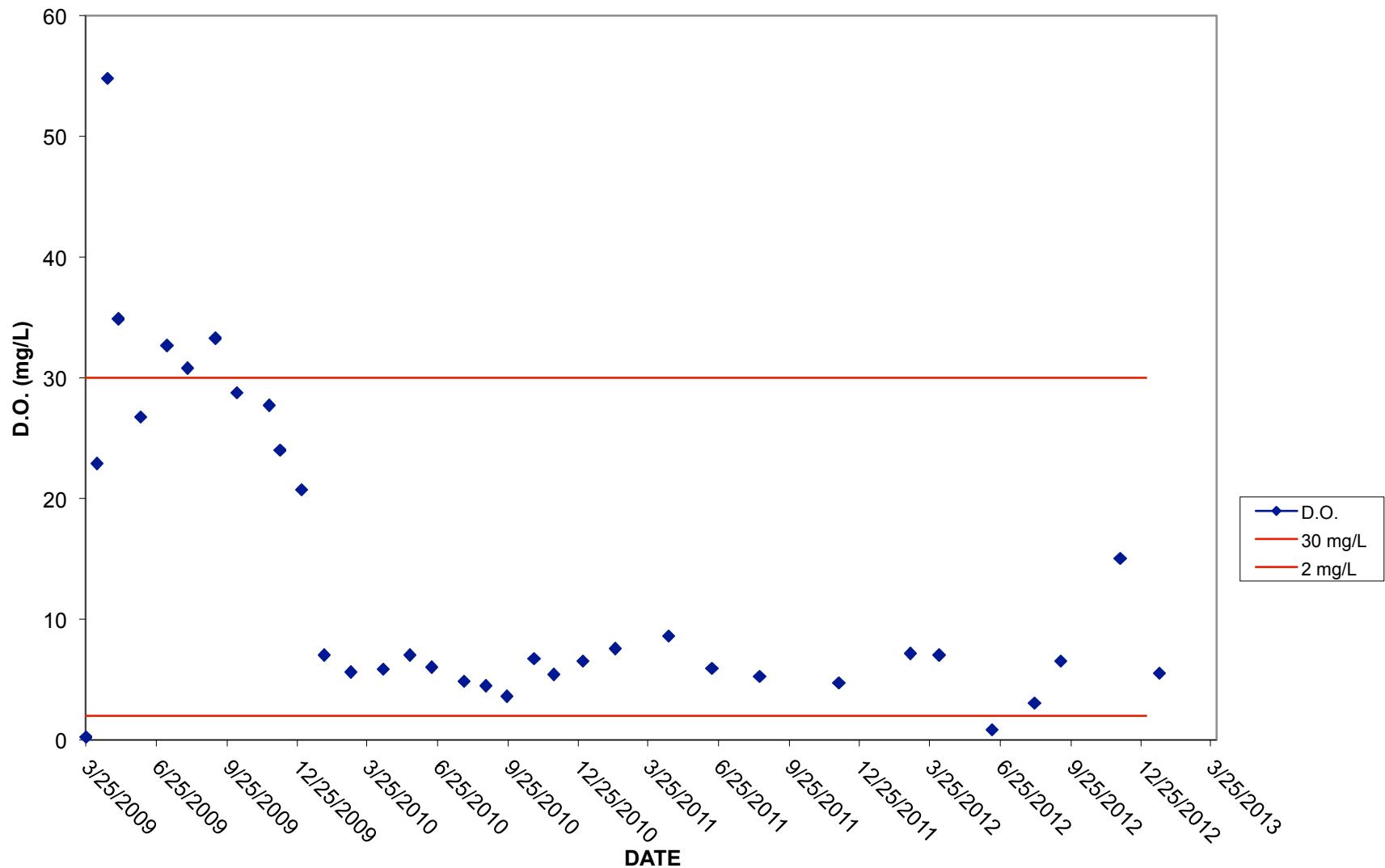
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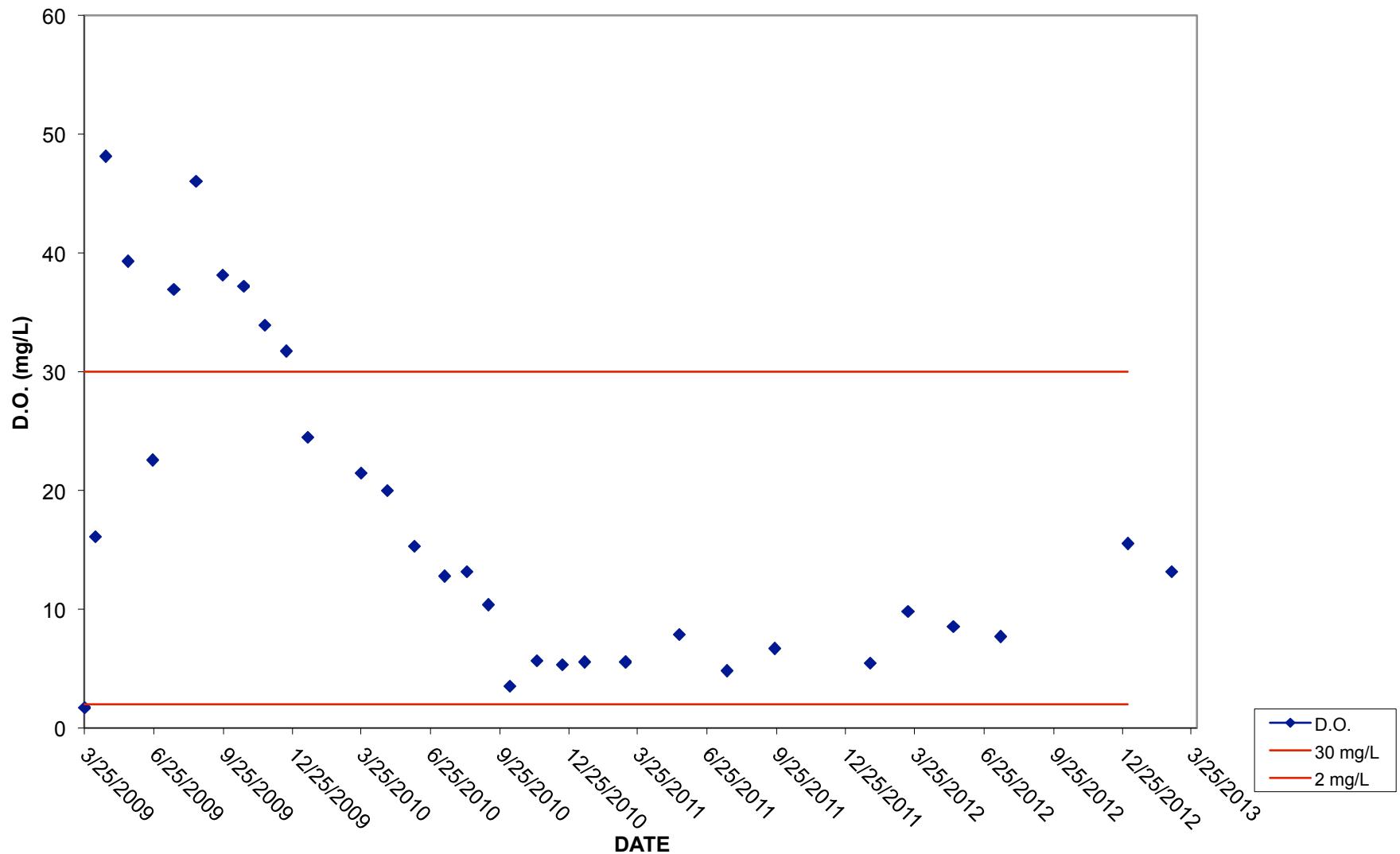
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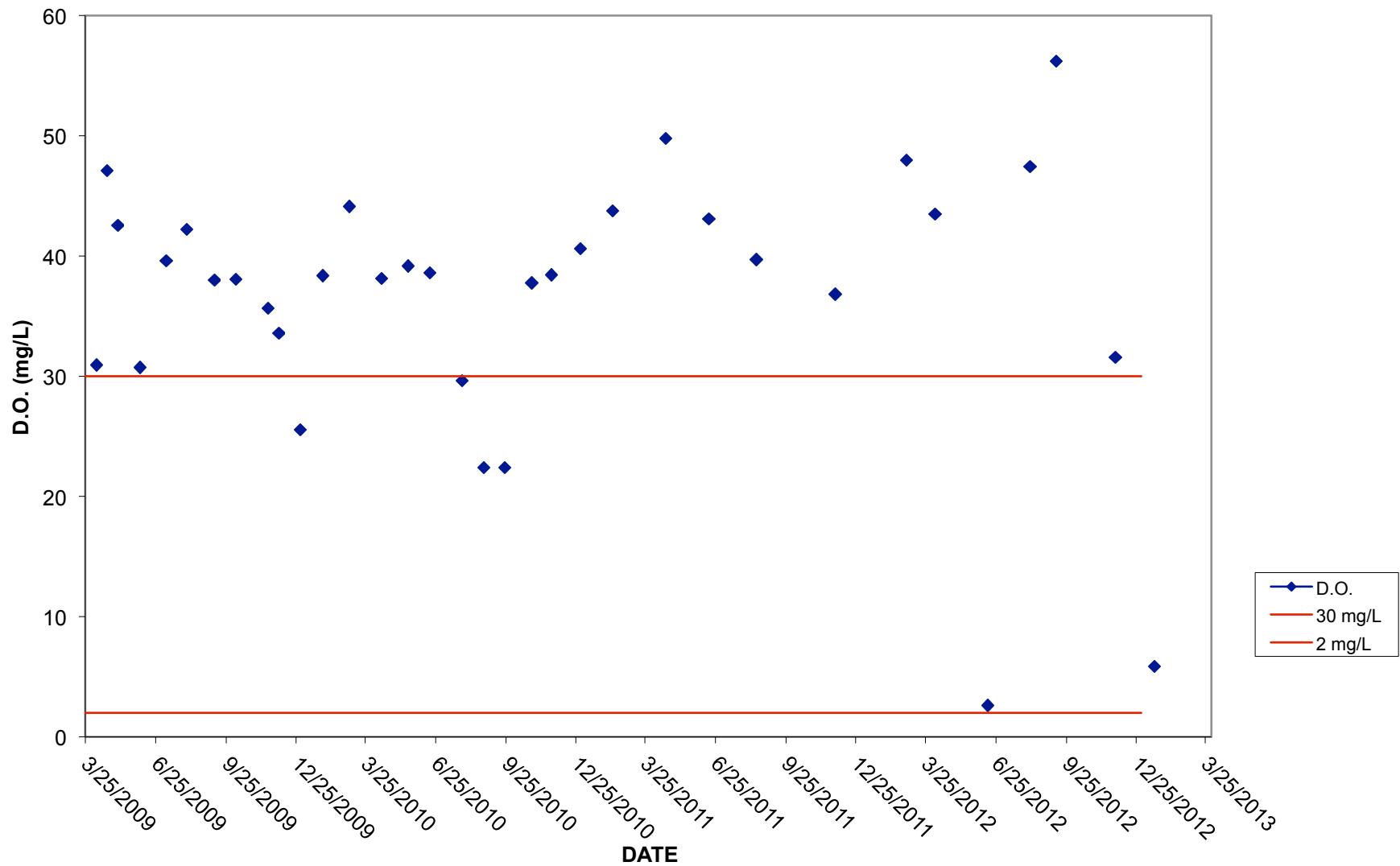
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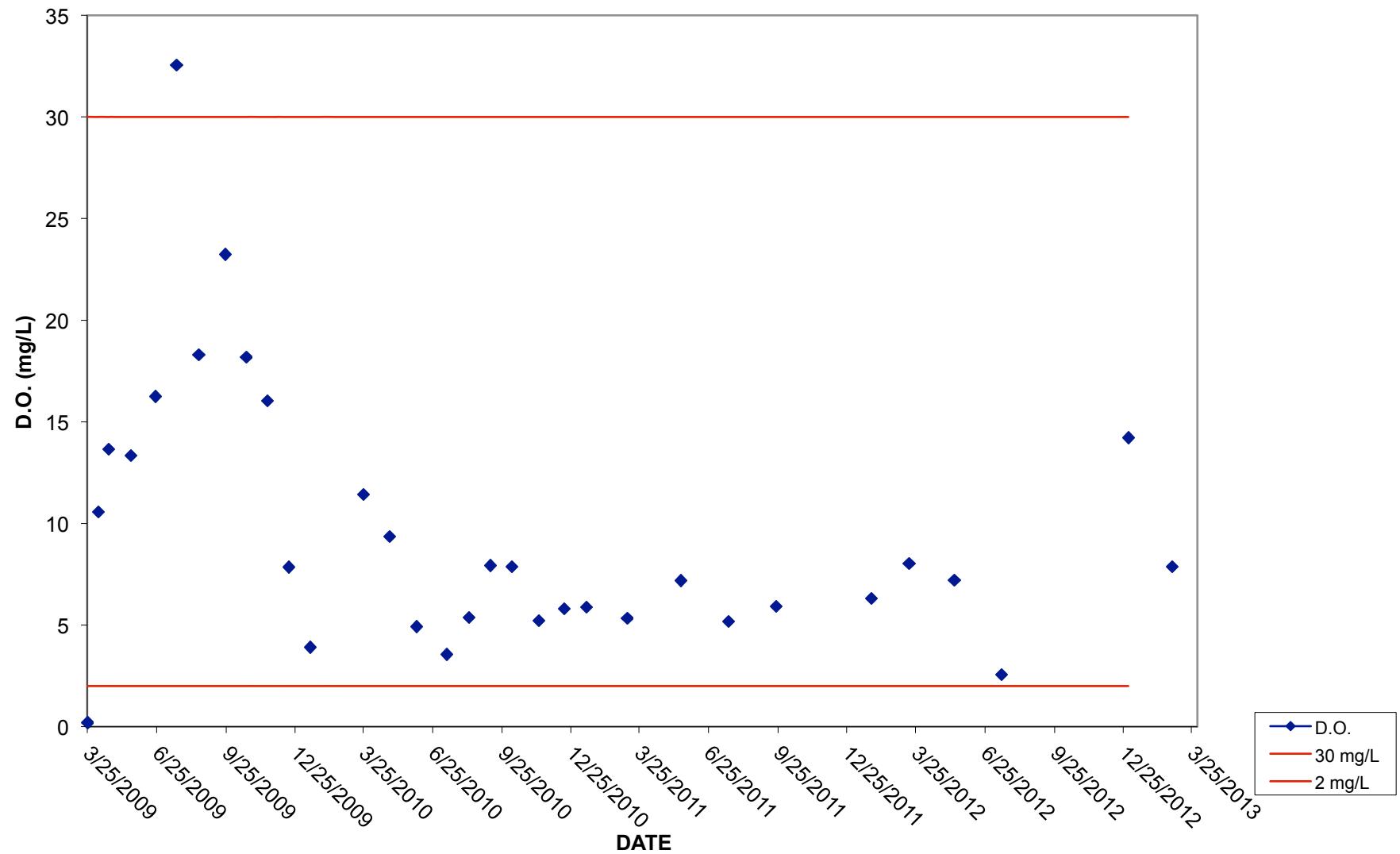
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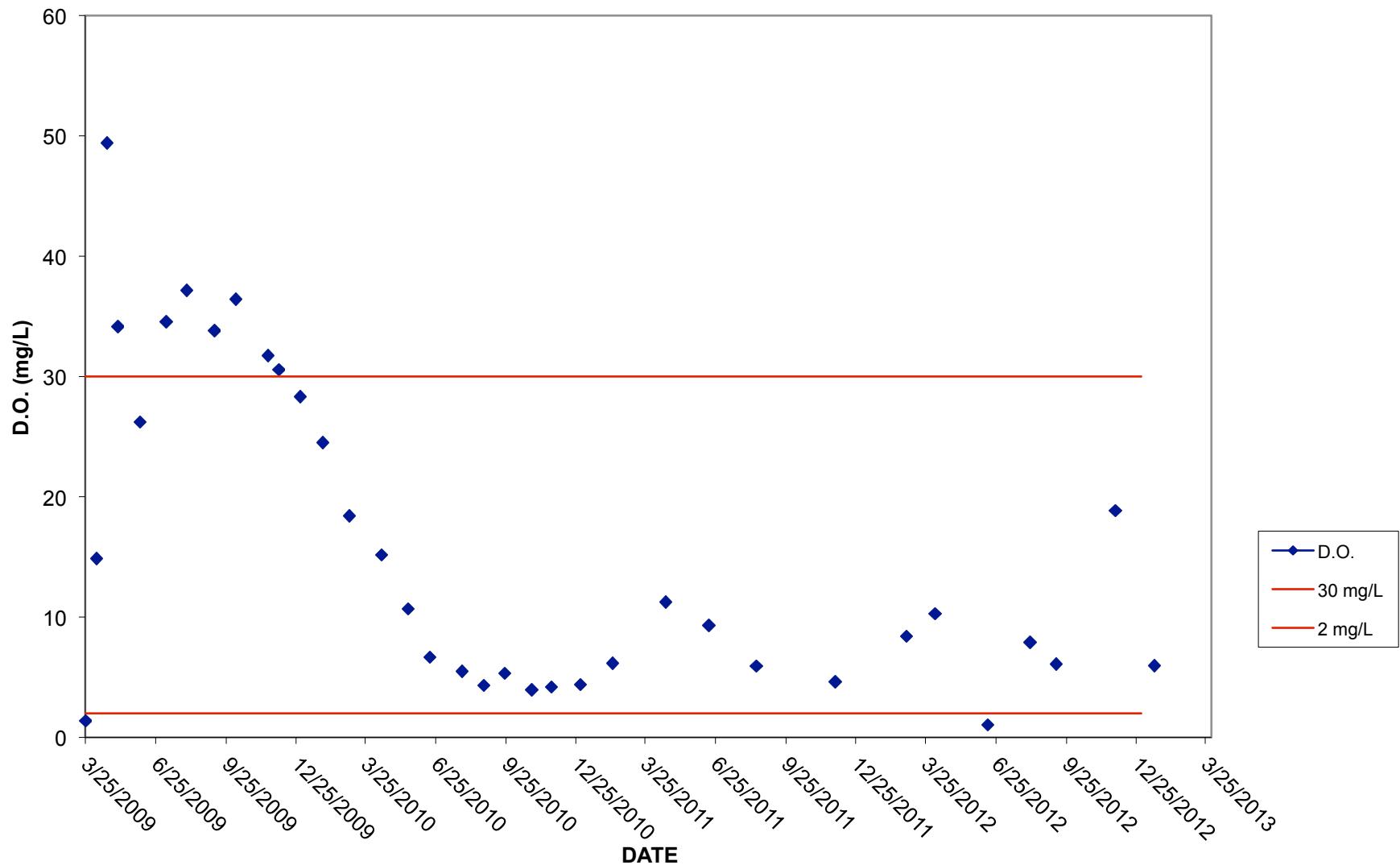
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IW-26D D.O. FIELD DATA vs TIME



IW-27D D.O. FIELD DATA vs TIME

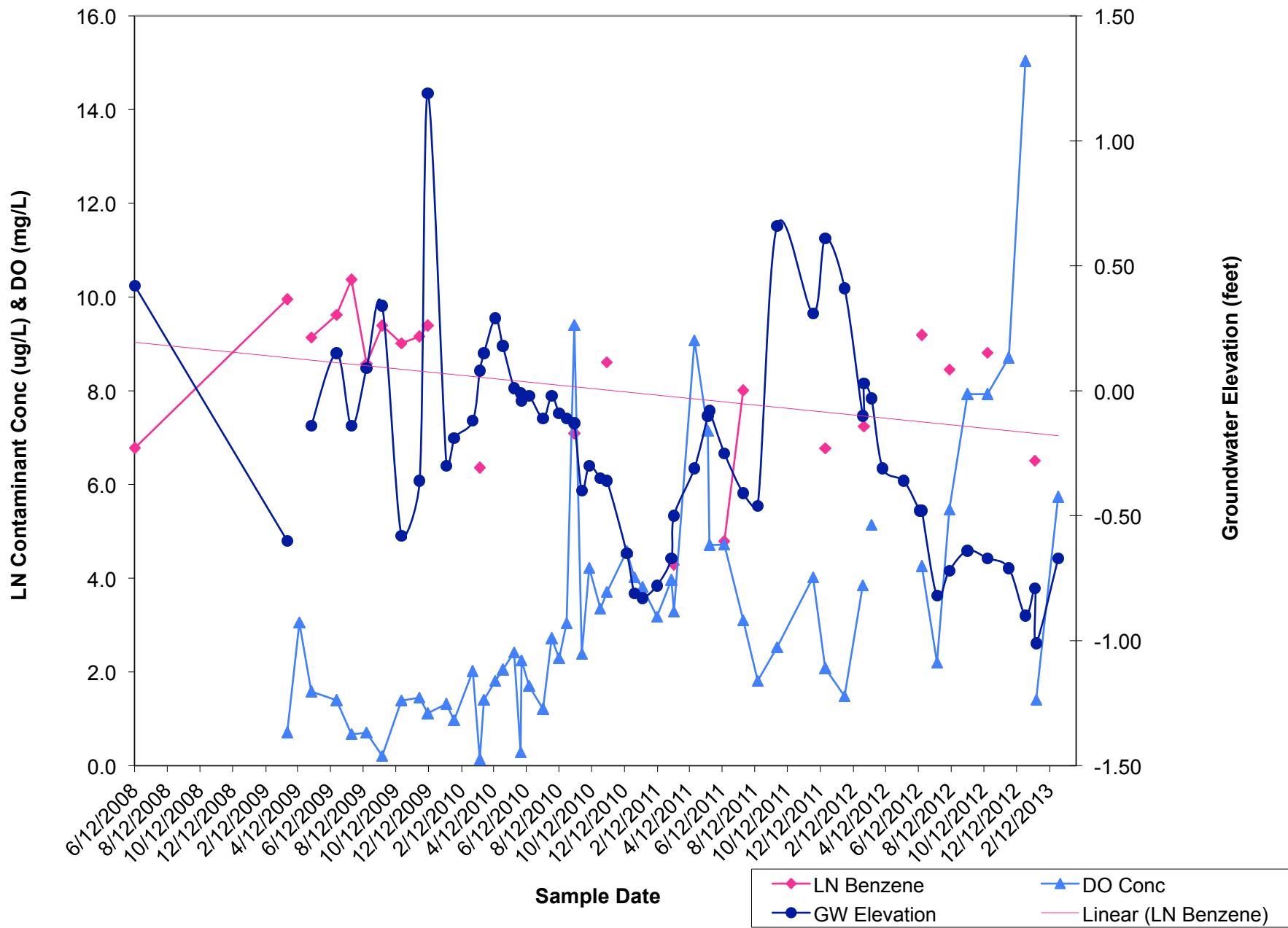




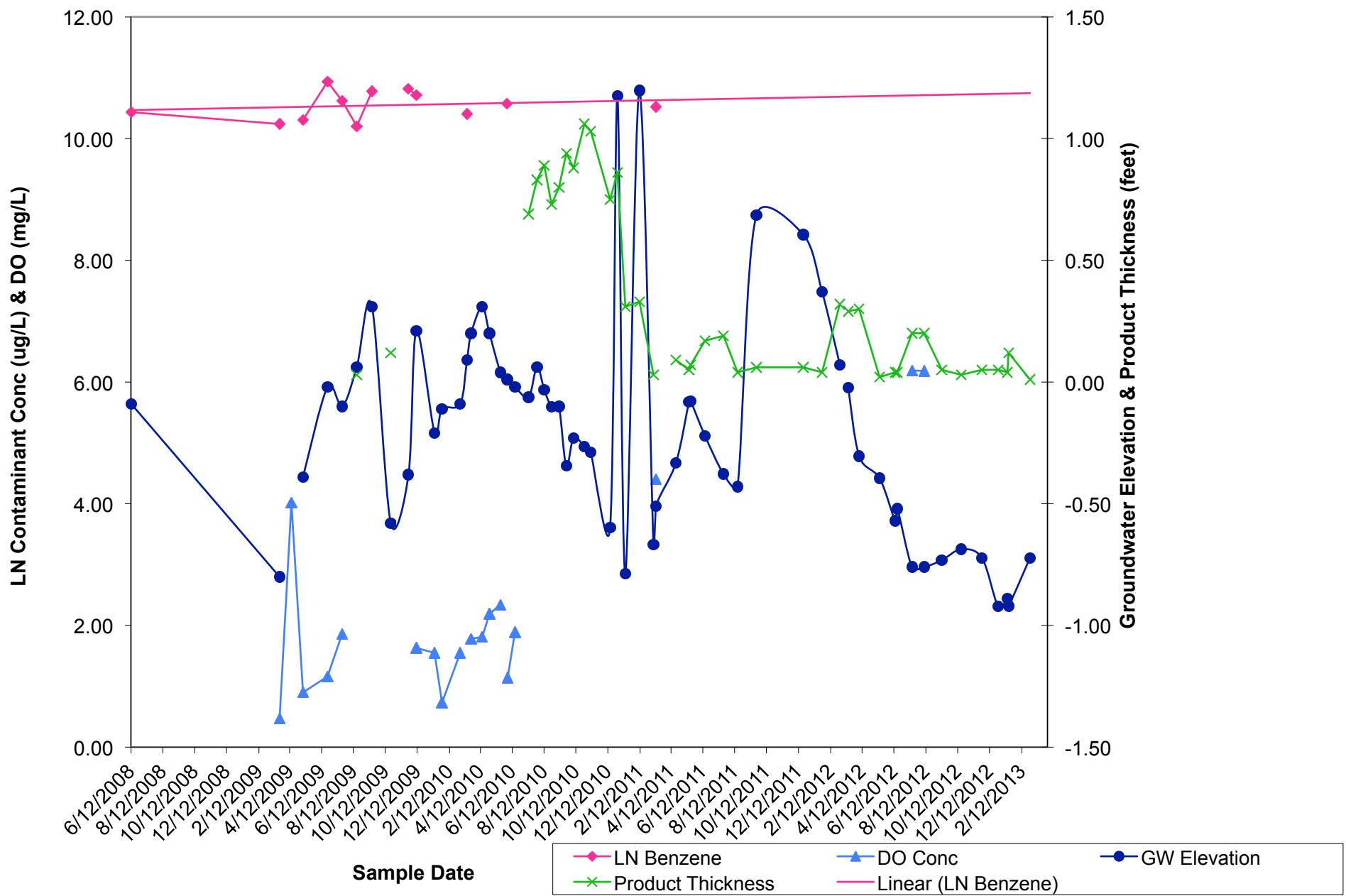
ATTACHMENT C

DO, Benzene and Groundwater Elevation vs Time Graphs

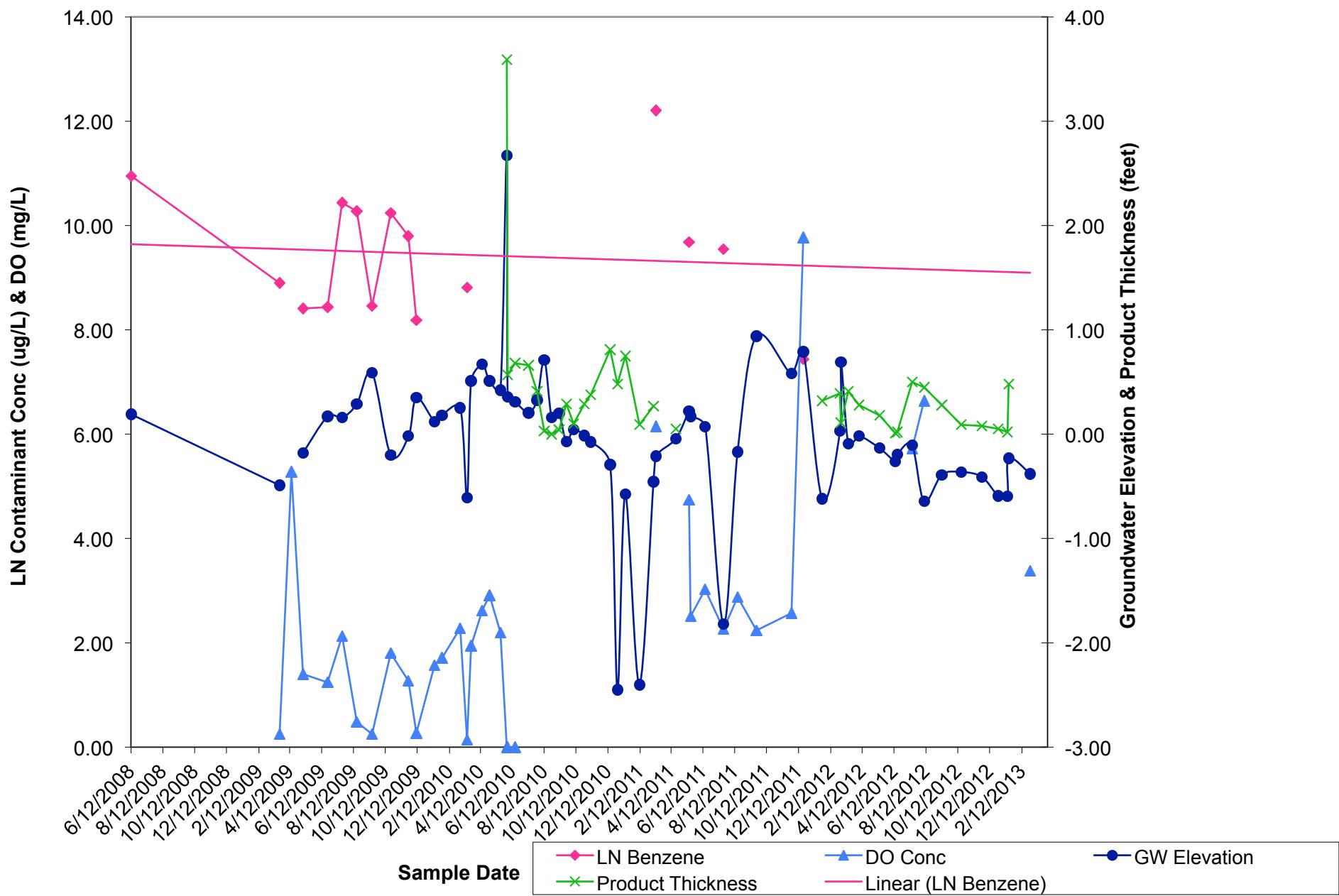
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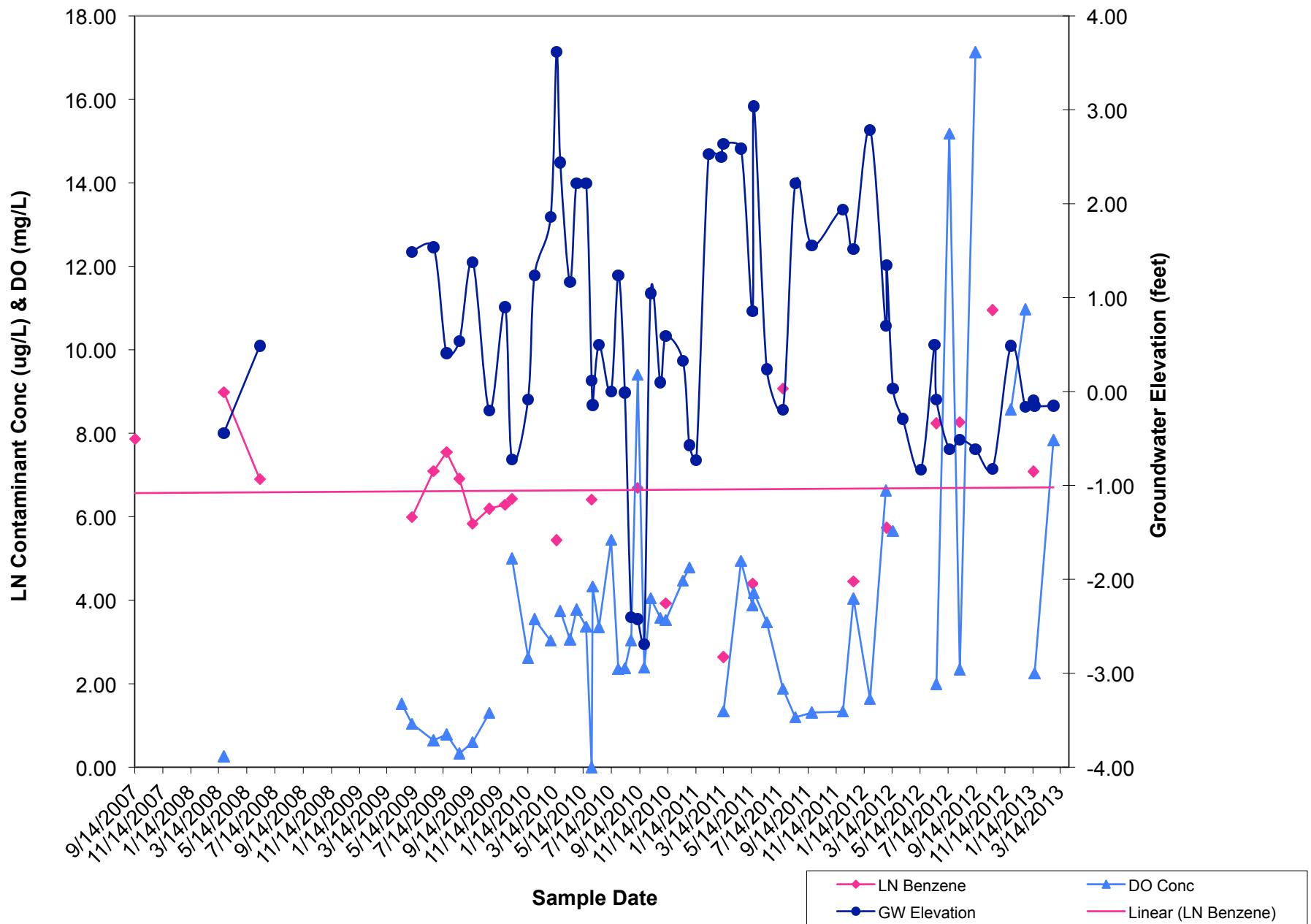
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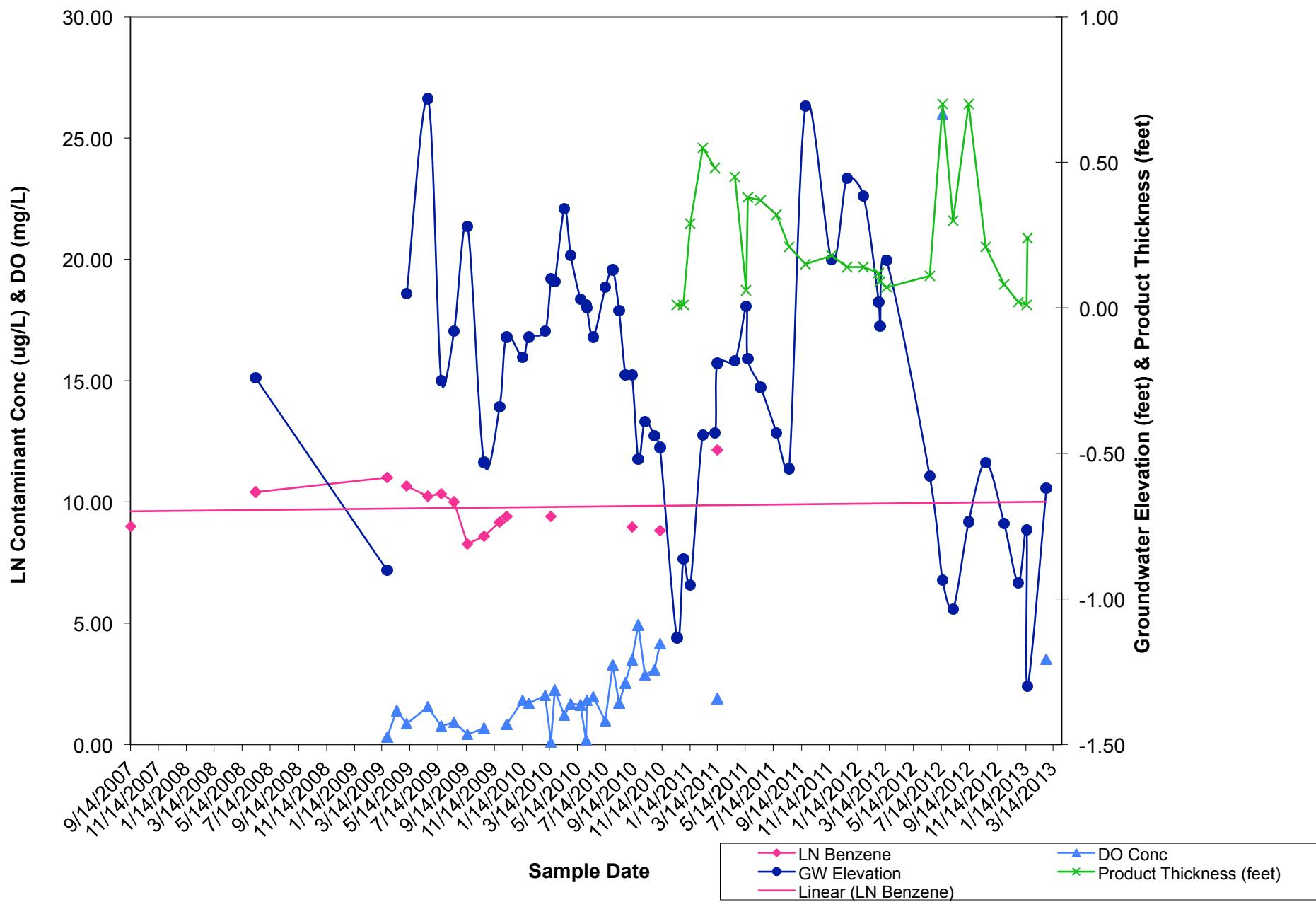
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S-230



S-231



S-232

